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3

DRUG MARKET TRENDS
CANNABIS OPIOIDS

WORLD DRUG REPORT 2022

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Vienna

World Drug Report
2022

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PREFACE

Drugs can kill.

Addiction can be an unending, agonizing struggle for the person using drugs; suffering is needlessly compounded when people cannot access evidence-based care or are subjected to discrimination. The consequences of drug use can have ripple effects that hurt families, potentially across generations, as well as friends and colleagues. Using drugs can endanger health and mental health and is especially harmful in early adolescence. Illicit drug markets are linked with violence and other forms of crime. Drugs can fuel and prolong conflict, and the destabilizing effects as well as the social and economic costs hinder sustainable development.

The whole of the international community shares the same goals of protecting the health and welfare of people everywhere. But too often in the debate on drug policy approaches, we forget this basic and shared understanding, which is rooted in the fact that drug use for non-medical purposes is harmful.

We all want our children and loved ones to be healthy, and we want neighbourhoods and countries to be safe. As policymakers, we can see that illicit drug cultivation offers no way out for impoverished communities in the long run, that the drug trade has environmental impacts, and that drug trafficking along with associated corruption and illicit flows undermine the rule of law and stability.

Solutions to these shared threats and challenges to achieve our shared goals must also be shared and based on evidence. It is in this spirit that I am proud to present the World Drug Report 2022 from the United Nations Office on Drugs and Crime.

This is the first World Drug Report of the post-pandemic world. While countries continue to grapple with COVID-19 and its consequences, we have emerged from cycles of lockdowns to confront a “new normal”. And we have found that the world post-pandemic remains one in crisis, faced with multiple conflicts, a continuing climate emergency and threat of recession, even as the multilateral order is showing troubling signs of strain and fatigue.

World drug challenges further complicate the picture. Cocaine production is at a record high, and seizures of amphetamine and methamphetamine have skyrocketed. Markets for these drugs are expanding to new and more vulnerable regions.

Harmful patterns of drug use likely increased during the pandemic. More young people are using drugs compared with previous generations. People in need of treatment cannot get it, women most of all. Women account for over 40 percent of people using pharmaceutical drugs for non-medical purposes, and nearly one in two people using amphetamine-type stimulants (ATS), but only one in five in treatment for ATS is a woman.

In the face of these multiple crises, we need to show greater care.

Care starts with evidence-based prevention and addressing perceptions and misperceptions of risk, including by taking a hard look at the messages our societies are sending to young people. UNODC research has shown that perceptions of cannabis harms have decreased in areas where the drug has been legalized. At the same time, the proportion of people with psychiatric disorders and suicides associated with regular cannabis use has increased, together with the number of hospitalizations. Some 40 per cent of countries reported cannabis as the drug related to the greatest number of drug use disorders.

Whole-of-society approaches are needed to ensure that people, young people most of all, have the information and develop the resilience to make good choices and that they can access science-based treatment and services for drug use disorders, HIV and related diseases when they need it.

There can be no effective prevention or treatment without recognition of the problem and the necessary funding to address the problem. Public resources are stretched to the limit by competing demands, but we cannot afford to let commitment wane. We need to promote compassion and better understanding.

Care in crises means ensuring services and essential medicines for all, including people in emergencies and humanitarian settings; people left behind in the pandemic; and people facing barriers of stigma and discrimination.

Care is also manifested in shared responsibility, and we need to renew international cooperation to sustainably reduce illicit crop cultivation and tackle the criminal groups trafficking drugs.

The World Drug Report seeks to offer the data and insights to inform our joint efforts. This year's edition delves into the interplay between drugs and conflict, the impact of drugs on the environment and the effects of cannabis legalization, and identifies dynamics to watch, from the opiate market in light of developments in Afghanistan to dark web drug sales.

I hope the report serves as a basis for effective responses, and generates the support we need to continue shedding light on different aspects of the world drug problem, and assisting Member States to take action and save lives.

Ghada Waly, Executive Director
United Nations Office on Drugs and Crime

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EXPLANATORY NOTES

The designations employed and the presentation of the material in the *World Drug Report* do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Countries and areas are referred to by the names that were in official use at the time the relevant data were collected.

Since there is some scientific and legal ambiguity about the distinctions between "drug use", "drug misuse" and "drug abuse", the neutral term "drug use" is used in the *World Drug Report*. The term "misuse" is used only to denote the non-medical use of prescription drugs.

All uses of the word "drug" and the term "drug use" in the *World Drug Report* refer to substances controlled under the international drug control conventions, and their non-medical use.

The term "seizures" is used in the *World Drug Report* to refer to quantities of drugs seized, unless otherwise specified.

All analysis contained in the *World Drug Report* is based on the official data submitted by Member States to the UNODC through the annual report questionnaire unless indicated otherwise. Sex-disaggregated analysis has been included wherever possible.

The data on population used in the *World Drug Report* are taken from: World Population Prospects: The 2019 Revision (United Nations, Department of Economic and Social Affairs, Population Division).

References to dollars ($) are to United States dollars, unless otherwise stated.

References to tons are to metric tons, unless otherwise stated.

The following abbreviations have been used in the present booklet:

AIDS	acquired immune deficiency syndrome
CBD	cannabidiol
COVID-19	coronavirus disease
Δ9-THC	*delta*-9-tetrahydrocannabinol
ECOWAS	Economic Community of West African States
EMCDDA	European Monitoring Centre for Drugs and Drug Addiction
EURO-DEN Plus	European Drug Emergencies Network
FAO	Food and Agriculture Organization of the United Nations
ha	hectares
INCB	International Narcotics Control Board
S-DDD	defined daily doses for statistical purposes
THC	tetrahydrocannabinol
UNODC	United Nations Office on Drugs and Crime
WHO	World Health Organization

WORLD DRUG REPORT 2022

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BOOKLET 2 — GLOBAL OVERVIEW OF
DRUG DEMAND AND DRUG SUPPLY

BOOKLET 3 — DRUG MARKET TRENDS OF
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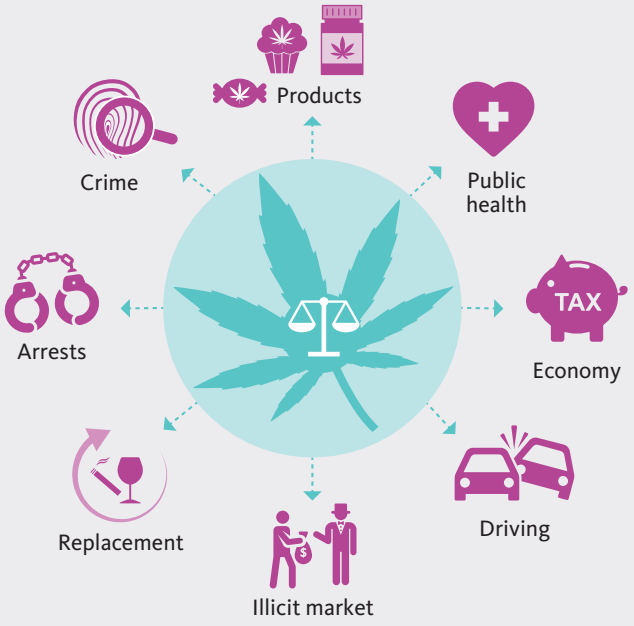
SCOPE OF THE BOOKLET

This third booklet of the *World Drug Report 2022* has a dual focus: opioids and cannabis.

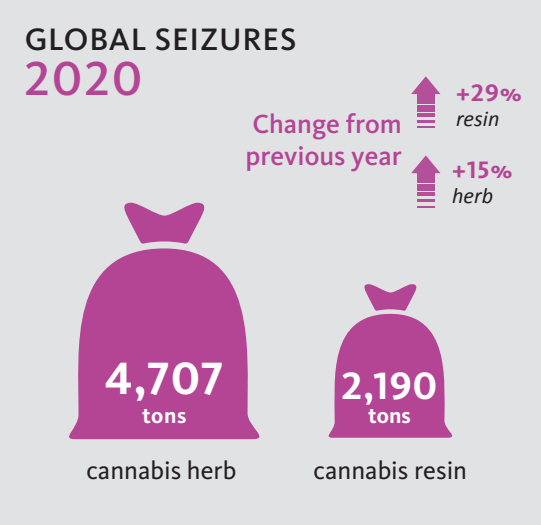
The first chapter of the booklet provides an overview of opioids as a group of substances and their patterns of non-medical use at the global level. It also reviews the latest trends in the global supply of opiates and synthetic opioids and the availability of pharmaceutical opioids for medical consumption. Issues specific to regional patterns and trends in opioid markets are also analysed, including the opioid crisis in North America and in Africa and the Middle East. The chapter also includes a discussion of the potential impact, in the region and worldwide, of changes in opium poppy cultivation and opium production in Afghanistan.

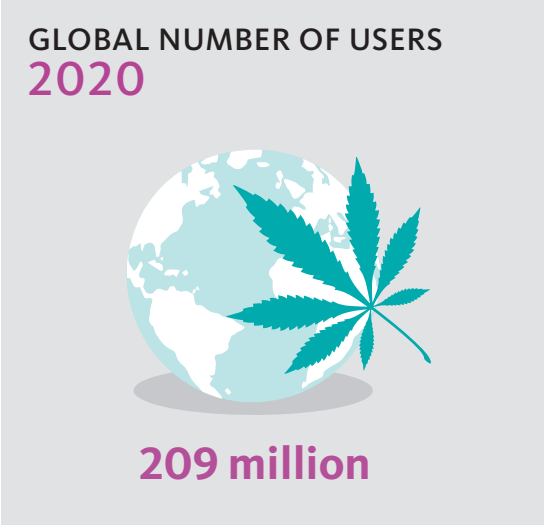
The second chapter of the present booklet starts with an analysis of the global supply of and trafficking trends in cannabis resin and herb. It provides the latest estimates on cannabis use and discusses the latest trends in regional cannabis markets. The chapter also briefly reviews the medical use of cannabinoid-based pharmaceutical products and the extent to which countries allow medical use of cannabis products. The chapter continues with a brief overview of the latest developments in cannabis regulations in selected countries and concludes with a detailed analysis of early indications of the impact of cannabis legalization on public health, public safety, market dynamics and criminal justice responses in the jurisdictions in North America that have legalized the non-medical use of cannabis.

IMPACT OF CANNABIS LEGALIZATION



CANNABIS





* Data refer to 2020.

Global supply of cannabis

Cannabis cultivation is near universal

Cannabis is illicitly produced in every region. Cannabis cultivation was reported either through direct indicators (such as cultivation or eradication of plants or eradication of production sites) or indirect indicators (seizure of plants, reports on origin of seized cannabis) by at least 154 countries in the period 2010–2020. If qualitative information on indoor and outdoor cannabis cultivation trends is also considered, this number rises to more than 190 countries and territories.[1] That distinguishes cannabis from coca/cocaine and opium poppies/opiates, for which cultivation/production is concentrated in a much smaller number of countries and, hence, their illicit trade is most often international in the sense of crossing international borders.

Cannabis cultivation has trended upward for a decade, according to qualitative assessments, and this remained true for 2020, with most Member States again reporting increases on their territory.

Growth in indoor cannabis cultivation seems to outpace growth in outdoor cultivation

In 2019 and 2020, reported growth in indoor cannabis cultivation appears to have again outpaced growth in outdoor cultivation at the global level, with the overall net number of countries reporting increased indoor cultivation being three times the net number of countries reporting decreased outdoor cultivation. While qualitative reporting has strong limitations, the patterns that emerge from it suggest an upward trend. The number of countries reporting indoor cannabis cultivation rose from 48 in the period 2011–2015 to 66 in the period 2016–2020. A total of 98 countries explicitly reported outdoor cannabis cultivation in the latter period.

Source countries for cannabis

Estimating the global area under cannabis cultivation is challenging as most countries do not have systems in place to systematically monitor this indicator. Some countries do report total area under cannabis cultivation, but most of these reported estimates are not based on standard methods and thus have limitations in being used for international comparisons. In addition, a number of indirect indicators are available, such as information on "hectares of cannabis eradicated", "number of cannabis plants eradicated", "number of cannabis sites eradicated", "number of cannabis plants seized" as well as information on "origin of cannabis seized", which can provide some indications with respect to cannabis cultivation. While any single such indicator alone is insufficient for revealing the extent of cannabis cultivation and production, when they are analysed together, they can still point to countries where substantial cannabis cultivation is likely to exist.[i]

Analysis of the various indicators for the period 2010–2020 suggests that in the following countries there is a sizable cultivation of cannabis that is (a) exported or (b) produced for domestic consumption (listed by order of importance in each subregion):

› Americas

North America: United States of America, Mexico, Canada

South America: Paraguay, Brazil, Colombia

Central America: Guatemala, Costa Rica, Honduras

Caribbean: Jamaica, Trinidad and Tobago

› Africa

Morocco, Egypt, South Africa, Nigeria, Eswatini, Ghana, Zambia

› Europe

Western and Central Europe: the Netherlands, Spain, Czechia, Italy, Switzerland

South-Eastern Europe: Albania, Turkey, Romania, Bulgaria

Eastern Europe: the Russian Federation, Ukraine

› Asia

Near and Middle East/South-West Asia: Afghanistan, Lebanon, Pakistan

Central Asia: Kyrgyzstan, Kazakhstan

Transcaucasia: Azerbaijan, Armenia

South Asia: India, Nepal

South-East Asia: Philippines, Lao People's Democratic Republic, Thailand, Indonesia

› Oceania

Australia, New Zealand

[i] Data for direct and indirect indicators have been combined to identify those countries likely to have a significant area under cannabis cultivation.

Historically, most countries reporting indoor cultivation have been in Europe and North America, but recent years have seen them joined by countries in numerous other regions and subregions.

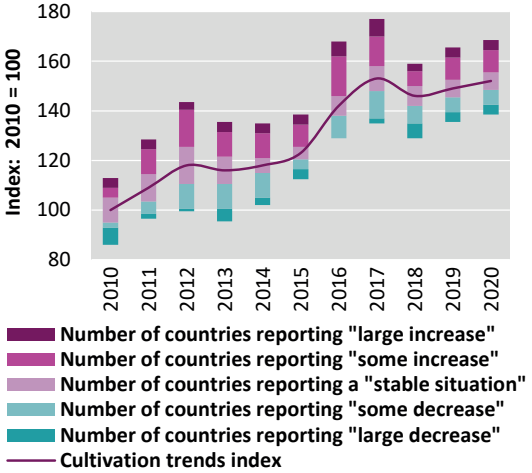
Cannabis trafficking: the prior downward trend in global seizures was reversed in 2020

Quantities of cannabis herb and resin seized clearly increased in 2020. This halted a decade of declining seizures of cannabis herb, a trend which accelerated in the period 2015–2019 when a number of jurisdictions in North America legalized non-medical cannabis. The increase in global seizures in 2020 is in line with reports that cannabis use increased during the coronavirus disease (COVID-19) pandemic in many countries.[a] The overall year-on-year increase in quantities of cannabis seized amounted close to 20 per cent in 2020, the biggest upward jump since 2015. Cannabis seizures made outside North America reached an all-time high in 2020.

In contrast to the overall decline in cannabis herb seizures between 2010 and 2019, the trends in cannabis trafficking (based on qualitative reporting from Member States) rose over the last decade. Despite the limitations that such qualitative reporting poses in terms of transparency and consistency, this trend suggests an increase in cannabis herb trafficking. In 2020,

a See also Booklet 2 of the present report, *Global overview of drug demand and drug supply.*

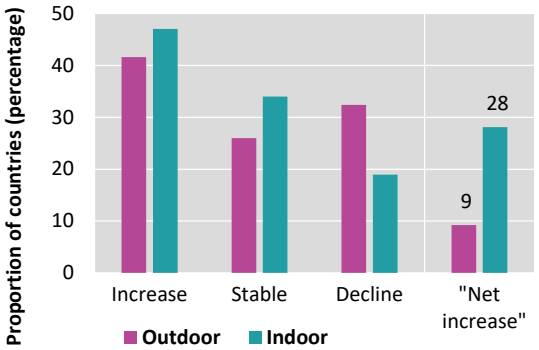
FIG. 1 Reported trends in cannabis cultivation, 2010-2020



Source: UNODC, responses to the annual report questionnaire.

Note: The cultivation trends index is based on qualitative information on trends in cannabis cultivation reported by Member States Calculations are based on the reports of 112 countries – on average, 34 countries per year over the period 2010–2020. The trend line is calculated based on the number of countries reporting increases minus the number of countries reporting decreases (2 points for "large increase", 1 point for "some increase", 0 points for a "stable situation", -1 point for "some decrease", -2 points for "large decrease").

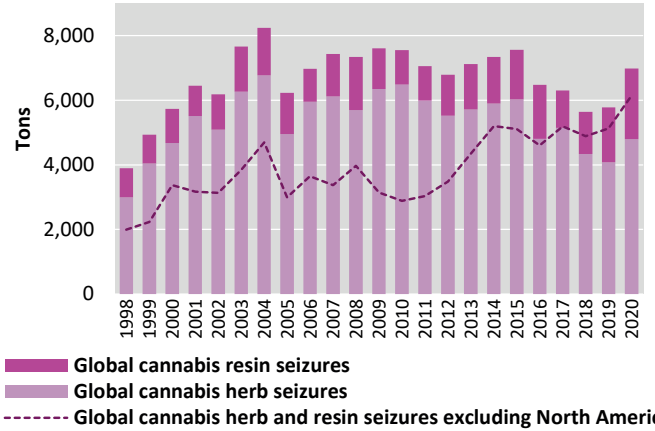
FIG. 2 Reported trends in outdoor and indoor cannabis cultivation, 2012–2020



Source: UNODC, responses to the annual report questionnaire.

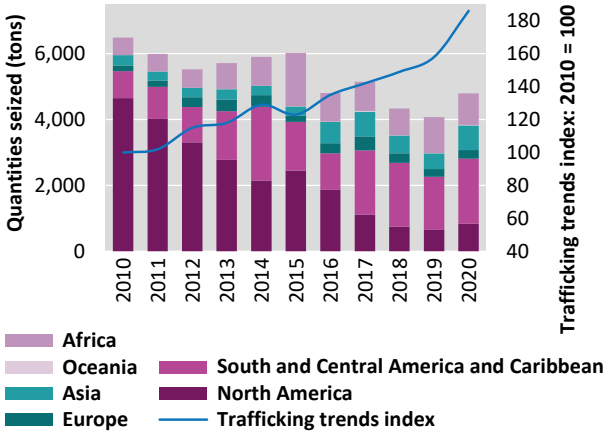
Note: The figure is based on qualitative information on trends in indoor and outdoor cannabis cultivation reported by Member States. The "net increase" shown in the figure refers to the number of countries reporting increases minus the number of countries reporting decreases in cannabis cultivation over the period 2011-2020, presented as a proportion of the total number of countries providing trends on outdoor cannabis cultivation and on indoor cannabis cultivation respectively.

FIG. 3 Global quantities of cannabis seized, 1998–2020



Source: UNODC, responses to the annual report questionnaire.

FIG. 4 Cannabis herb seized and reported trends in cannabis herb trafficking, 2010–2020



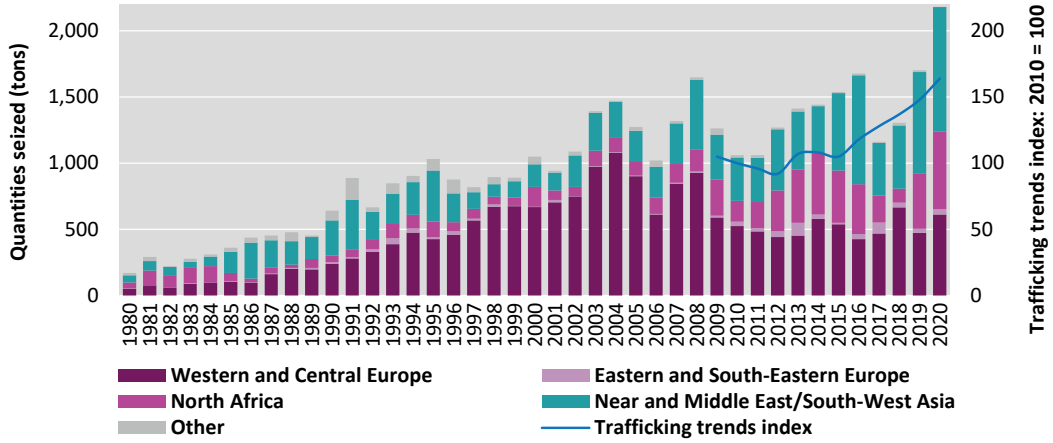
Source: UNODC, responses to the annual report questionnaire.

Note: Because of the uneven coverage of reporting, some regions, notably Africa, may be underrepresented in seizure data.

reported qualitative trends in cannabis herb trafficking and quantities of cannabis herb seized moved upwards, with increases reported from most regions.

Seizures of cannabis resin increased to a record high in 2020. Qualitative assessment trends reported by Member States in 2020 suggest that this reflected growing cannabis resin trafficking activities worldwide.

FIG. 5 Quantities of cannabis resin seized and reported trends in cannabis resin trafficking, 1980–2020



Source: UNODC, responses to the annual report questionnaire.

Global use of cannabis

Global prevalence of cannabis use up modestly, number of users continues to rise

Cannabis remains the most widely used drug worldwide. In 2020, more than 4 per cent of the global population aged 15–64 (209 million people) had used cannabis in the past year. The prevalence of past-year cannabis use has increased by 8 per cent, from 3.8 per cent in 2010, while the number of people who used cannabis in the past year increased by 23 per cent, from 170 million in 2010, partly owing to increase in global population.

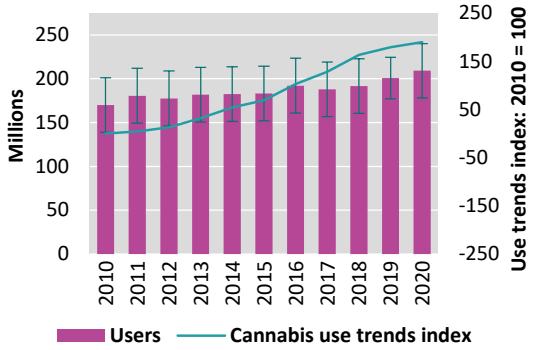
Prevalence of use of cannabis varies widely by region and is highest in North America, Australia and New Zealand, and West Africa.

Compared with adults, the past-year prevalence of cannabis use is reported to be higher among adolescents (5.8 per cent in those aged 15–16).[b]

b See also Booklet 2 of the present report, *Global overview of drug demand and drug supply.*

Scientific literature indicates that early initiation of substance use impacts the developing brain of adolescents. Early initiation of substance use has a higher likelihood of leading to regular use in both late

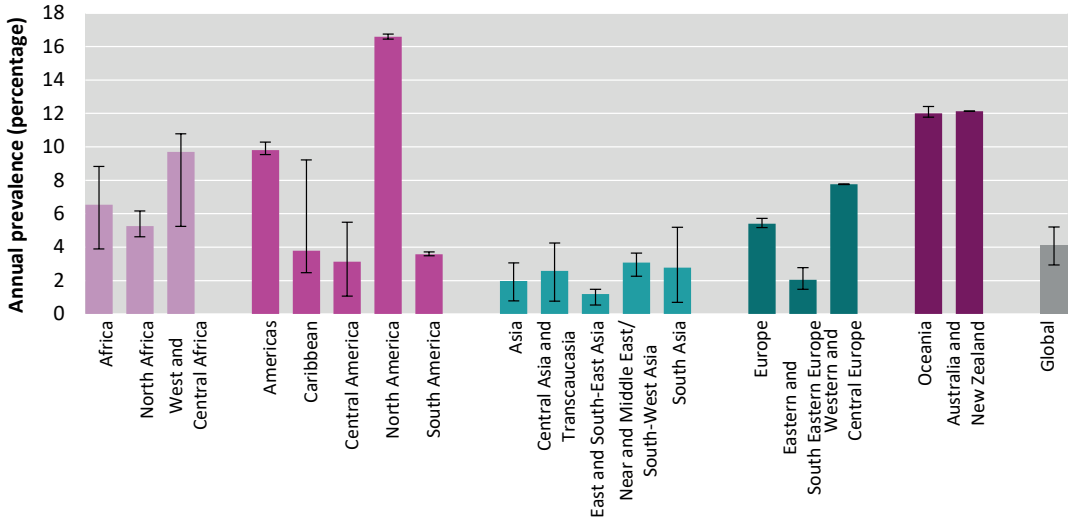
FIG. 6 Global number of people who use cannabis and reported trends in cannabis use, 2010–2020



Source: UNODC, responses to the annual report questionnaire.

Notes: Estimated number of people aged 15-64 who used cannabis in the past year. The cannabis use trends index is based on qualitative information on trends in cannabis use reported by Member States (on average, 67 countries per year in 2010-2020). The trend line is calculated on the basis of the number of countries reporting increases minus the number of countries reporting decreases (2 points for "large increase", 1 point for "some increase", 0 points for "no change", -1 point for "some decrease", -2 points for "large decrease").

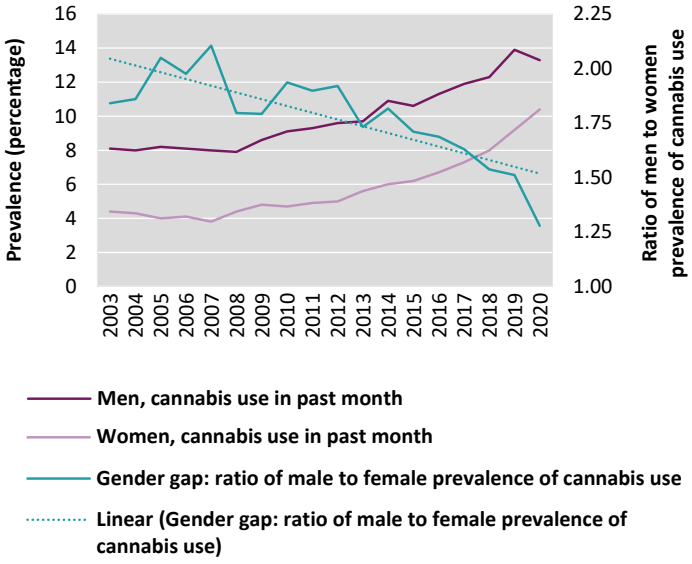
FIG. 7 Use of cannabis, by region and subregion, 2020



Source: UNODC, responses to the annual report questionnaire.

Note: Data are not shown for subregions where recent estimates (not older than 10 years) were not available from countries and thus subregional estimates could not be computed.

FIG. 8 Narrowing the gender gap in the past-month prevalence of cannabis use among the population aged 12 years and older in the United States, 2003–2020



Source: UNODC, elaboration based on data from Ibid.

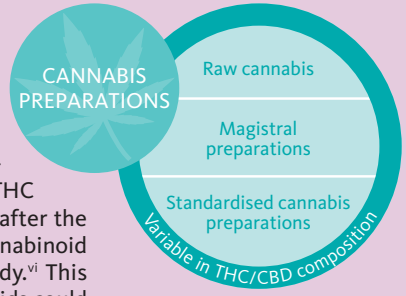
adolescence and young adulthood.[2] Early onset and frequent use of cannabis are also associated with an increased likelihood of major depressive disorders, as well as suicidal thoughts and behaviours.[3, 4, 5]

At the global level, approximately two thirds of past-year cannabis users are men,[6] but the proportion varies substantially by region.[c] In many high-income countries, the gender gap among people who use drugs seems to be narrowing, a trend reflected in the prevalence of different drugs, including cannabis, and substance use disorders. The gender difference in the use of cannabis, for instance, can be attributed more to opportunities to use drugs in different settings than to biological and psychological differences between men and women in the use of substances and the development of substance use disorders. The gender-defined environmental and sociocultural roles for men and women contribute significantly to the initiation and course of substance use and, thereafter, the development of substance use disorders.[7, 8, 9, 10]

c Ibid.

Medical use of cannabis herb, preparations and pharmaceuticals

Being part of the traditional Indian medicine, medical use of cannabis and cannabinoids is not a recent phenomenon[i, ii] Cannabis preparations such as cannabis tinctures (containing THC and other cannabinoids) were available in the nineteenth century in Europe, including Britain, and the United States to relieve pain and nausea[iii] The medical use of those cannabis preparations were, however, phased out in the twentieth century with the development of newer drugs that were based on clinical trials and which had standardized preparations and doses.[iv, v]



Source: Adapted from "Medical use of cannabis and cannabinoids: questions and answers for policymaking" (Luxembourg: EMCDDA, 2018).

Since the 1990s, there has been a renewed interest in the potential medical use of cannabis, cannabis extracts and pharmaceutical products (containing THC and other cannabinoids) after the discovery of the endocannabinoid system in the human body.[vi] This suggested that cannabinoids could be used as an alternative to treat certain conditions for which there was strong to moderate evidence of effectiveness. These conditions include, among others, chronic pain, neurological disorders such as multiple sclerosis-related spasticity, and some types of epilepsies. Some cannabinoids are also suggested for use as an antiemetic in the treatment of chemotherapy-induced nausea and vomiting in patients who fail to respond adequately to conventional antiemetic treatments.[vii]

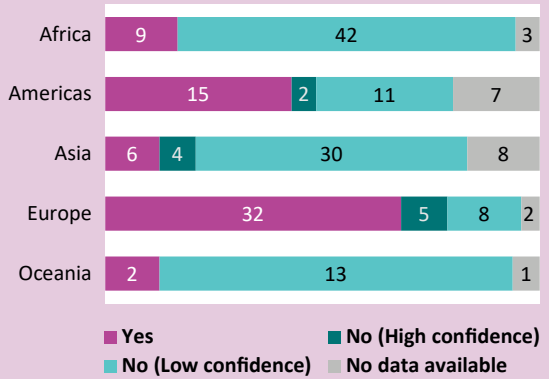
The following cannabinoid-based pharmaceuticals, with marketing authorization, are currently approved for medical use in a number of countries:[vii, ix, x]

Dronabinol. Oral capsules or an oral solution containing synthetic THC. Dronabinol is indicated for anorexia associated with weight loss in patients with AIDS and nausea and vomiting associated with cancer chemotherapy, usually after previous treatments have failed.

Nabilone. Oral capsules containing synthetic cannabinoid similar to THC, for use to treat nausea and vomiting associated with chemotherapy, usually after previous treatments have failed.

Nabiximols. A medicinal product containing approximately equal quantities of THC and CBD from two cannabis extracts. This product has been authorized for the treatment of muscle spasticity resulting from multiple sclerosis.

Number of countries having provisions for medical use of cannabis (cannabis herb and/or cannabinoid pharmaceutical preparations, 2021)



Source: Based on reporting/information from 200 countries (35 countries reporting through the annual report questionnaire and 165 countries based on official sources).

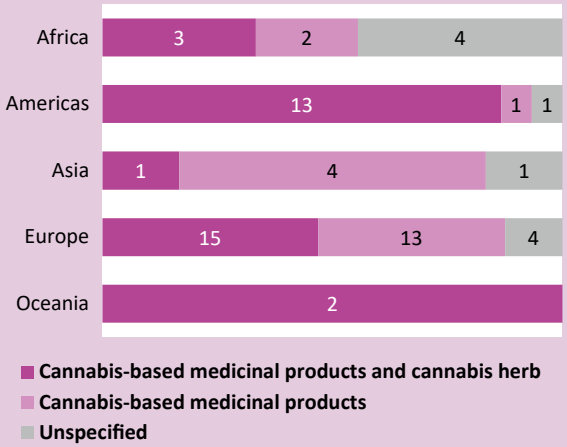
Note: The categories of "Yes" and "No (high confidence)" are information based on official national sources, international peer-reviewed reports, annual report questionnaire responses containing a reference to an official document and studies in peer-reviewed journals. The category of "No (low confidence)" is information based on responses to the annual report questionnaire with no reference to an official document, international reports or resources with a reference to an official document.

Epidiolex. A plant-derived CBD oral solution indicated for the treatment of seizures associated with Lennox-Gastaut syndrome or Dravet syndrome in patients 2 years of age or older.

Currently, 64 countries have provisions in their national legislation or guidelines allowing medical use of cannabinoid pharmaceutical preparations and/or cannabis herb for a range of medical conditions and with varying degrees of restrictions or permissiveness. Of those 64 countries, 34 countries allow the use of both pharmaceutical preparations and cannabis herb for medical conditions. In essence, all countries that allow medical use of cannabis herb also have provisions for medical use of cannabinoid pharmaceutical preparations.

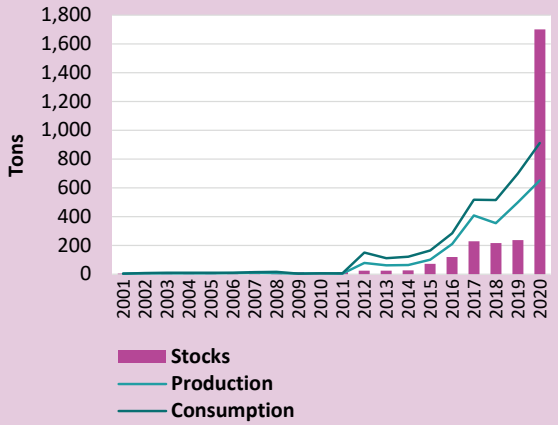
Around 40 countries reported to INCB in 2020[xi] their estimates of production, consumption or stocks of cannabis for medical purposes. Since 2011, an increasing number of countries have started to use cannabis and cannabis extracts for medical purposes, as well as for scientific research. Among those 40 reporting countries, the United Kingdom of Great Britain and Northern Ireland and Canada are the

Distribution of countries that allow medical use of cannabinoids by type of product, 2021



Source: Based on reporting/information from 59 countries (21 countries reporting through the annual report questionnaire, and 38 countries based on official sources).

Global production, consumption and stocks of medical cannabis, 2001–2020



Source: INCB, Narcotic Drugs: Estimated World Requirements for 2022 – Statistics for 2020 (E/INCB/2021/2)

Note: As reported in the INCB technical report (E/INCB/2021/2), for the purposes of the Single Convention on Narcotic Drugs of 1961 as amended by the 1972 Protocol, a drug is regarded as "consumed" when it has been supplied to any person or enterprise for retail distribution, medical use or scientific research. According to INCB estimates, the high stocks of medical cannabis products reported in 2020 reflect the stocks reported by United Kingdom (1449 tons) and Spain (88.9 tons).

two main producers of cannabis for medical use, accounting for 71 per cent of the global production of 650 tons of medical cannabis in 2020. The United Kingdom is the main source of cannabis extracts and pharmaceutical preparations containing cannabis extracts.

[i] Ethan Russo, "Cannabis in India: Ancient Lore and Modern Medicine," in *Cannabinoids as Therapeutics*, ed. Raphael Mechoulam, Milestones in Drug Therapy MDT (Basel: Birkhäuser-Verlag, 2005), 1–22, https://doi.org/10.1007/3-7643-7358-X_1.

[ii] Harold Kalant, "Medicinal Use of Cannabis: History and Current Status," *Pain Research and Management* 6, no. 2 (2001): 80–91, https://doi.org/10.1155/2001/469629.

[iii] Lester Grinspoon and James B. Bakalar, *Marihuana, the Forbidden Medicine*, Rev. and exp. ed (New Haven: Yale University Press, 1997).

[iv] Kalant, "Medicinal Use of Cannabis."

[v] *Medical Use of Cannabis and Cannabinoids: Questions and Answers for Policymaking* (Luxembourg: EMCDDA, 2018).

[vi] Ana Isabel Fraguas-Sánchez and Ana Isabel Torres-Suárez, "Medical Use of Cannabinoids," *Drugs* 78, no. 16 (November 2018): 1665–1703, https://doi.org/10.1007/s40265-018-0996-1.

[vii] National Academies of Sciences, Engineering, and Medicine et al., *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research*, The National Academies Collection: Reports Funded by National Institutes of Health (Washington D.C.: National Academies Press (US), 2017), http://www.ncbi.nlm.nih.gov/books/NBK423845/.

[viii] Ibid.

[ix] *Medical Use of Cannabis and Cannabinoids: Questions and Answers for Policymaking.*

[x] *Report of the International Narcotics Control Board for 2018.* (Vienna, Austria: United Nations, 2019).

[xi] Based on Estimated World Requirements for 2022 Statistics for 2020, (E/INCB/2021/2) (International Narcotics Control Board, 2022).

People regularly using cannabis were likely to increase consumption during the COVID-19 pandemic

The COVID-19 pandemic has had an impact on the socioeconomic situation and vulnerabilities of the population as well as their physical and psychological health. While overall, the market of major drugs including that of cannabis turned out to be remarkably resilient to these changes, during the pandemic some patterns of use by people regularly using drugs, including cannabis, showed some change.[d, 11]

Data available from Europe suggest that there were differences between and within countries in the availability and consumption of cannabis during and after the lockdown periods. For instance, a web-based survey from Europe showed that people who regularly used cannabis (defined as weekly use) were twice as likely to report increased frequency of use as were those who were occasional users during lockdowns and were three times more likely to report consuming greater quantities. Occasional users were more likely to have reduced or stopped using cannabis during lockdowns.[12] Stay-at-home measures were also reported to have been in part responsible for increased home cultivation of cannabis.[13]

Over the years, wastewater analysis for cannabis has been undertaken in only a few sites in Europe, and those have shown both considerable heterogeneity and variation in weekly patterns of cannabis consumption in the various locations. Also, the different characteristics of national, regional and local drug use patterns and of the lockdown measures implemented make comparisons challenging. Among the few locations, in Amsterdam and in Castellón, Spain, a slight, although not significant, decrease in cannabis metabolite mass loads in 2020 compared to 2019 was observed, while in 2020 no significant differences from the preceding year were observed in Utrecht and Eindhoven in the Netherlands.[14, 15]

In Canada, in 2021, nearly half of the people who had used cannabis in the past 12 months reported that they had used the same amounts of cannabis and with the same frequency during the COVID-19 pandemic and accompanying restrictions as they had before. More than a quarter of those who had used cannabis reported greater amounts and greater frequency of use than before the pandemic. Young people (24 years and younger) were more likely to report an increase in the amount and frequency of use during the lockdown restrictions compared to older people (25 years and older) who used cannabis. Among these older people, 25 per cent reported using more cannabis during the COVID-19 pandemic, which compares to 46 per cent among those aged 16-19 years and 40 per cent among those aged 20 and 24 years.[16, 17]

Almost half of persons detained by Australian police and interviewed for cannabis use patterns reported use in the previous 30 days, which was not significantly different from the cannabis use reported by police detainees before the pandemic. However, some change could be noted in frequency of use. Past-month users were significantly more likely to have increased use during the pandemic and were more likely to be heavy users, reporting a median of cannabis use of 25 days per month as compared with a median of 15 days per month as reported by detainees before the pandemic. Quantities of cannabis used during a typical session did not change (a median of 0.34 grams), although some detainees reported purchasing greater quantities of cannabis than usual at the onset of the pandemic to guard against potential shortages, and some reported substituting cannabis with benzodiazepines, methamphetamine and other drugs. Cannabis supply appeared stable during the pandemic, with detainees reporting continued high availability and unchanged quality of product.[18, 19]

Regional trends in cannabis markets

Trafficking in cannabis herb continues to be mainly intraregional

Unlike many other drugs, cultivation, trafficking and use of cannabis herb takes place primarily within the same region or subregion.[20] While most regions reported intraregional trafficking of cannabis herb, there were exceptions. For Oceania, the most frequently mentioned countries of origin, departure and

d See also Booklet 2 of the present report, *Global overview of drug demand and drug supply.*

Most frequently mentioned countries of origin, departure, and transit for cannabis herb in the period 2016–2020

(In order of number of mentions by countries worldwide)

› Americas

North America: United States, Canada, Mexico

South America: Colombia, Paraguay

Central America: Guatemala, Honduras

Caribbean: Jamaica

› Africa

West and Central Africa: Ghana, Nigeria

Southern Africa: Mozambique, South Africa, Malawi, Eswatini

East Africa: United Republic of Tanzania, Uganda, Kenya

North Africa: Morocco

› Europe

Netherlands, Albania

› Asia

South-East Asia: Myanmar, Malaysia, Thailand

South Asia: India, Bangladesh, Nepal

Near and Middle East/South-West Asia: Afghanistan, Lebanon

Central Asia and Transcaucasia: Kazakhstan, Kyrgyzstan

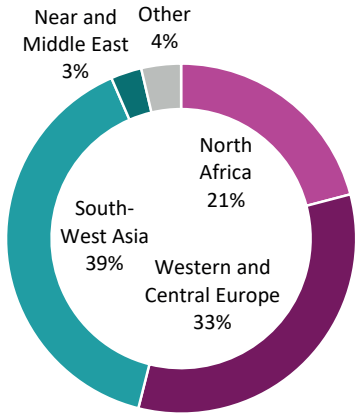
Source: UNODC, responses to the annual report questionnaire.

transit in the period 2016–2020 were the United States, the Netherlands and Canada.[21, 22] The United States and Canada were also frequently mentioned as countries of origin, departure and transit by countries in East and South-East Asia.

Cannabis resin seizures are geographically concentrated, but key trafficking flows are interregional

Seizures of cannabis resin continue to be concentrated in North Africa and Western Europe, which together form a single de facto production, trafficking and consumption area for cannabis resin, accounting for almost 60 per cent of global seizures in the period 2016–2020, as well as South-West Asia, another major production, trafficking and consumption area accounting for about one third of the global total. Those two areas are followed by the Near and Middle East.[23]

FIG. 9 **Distribution of quantities of cannabis resin seized, 2016–2020**

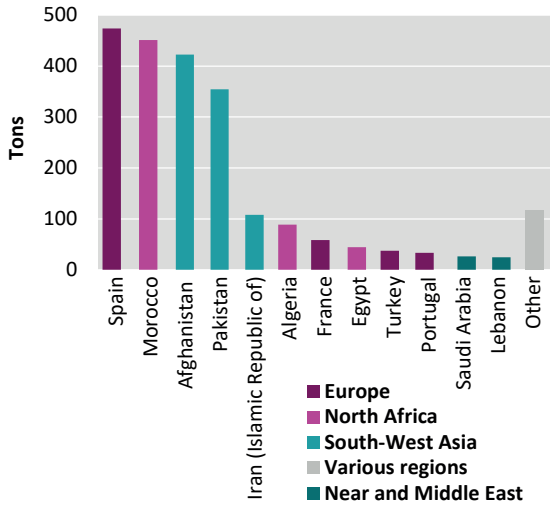


Source: UNODC, responses to the annual report questionnaire.

Seizure and other data suggest that most trafficking of cannabis resin is from Morocco to Spain, and from Afghanistan to other countries of West Asia. Spain serves as the primary gateway for markets in Western and Central Europe.[24] Cannabis resin from Morocco is also destined for other North African countries.[25] Intra-regional trafficking runs from Morocco to Libya and then Egypt, via the Sahel,[26] as well as internal land routes from western Algeria to that country's borders with Tunisia and Libya, despite strong security controls.[27] Cannabis resin is also transported by sea via the southern Mediterranean coastal route.[28]

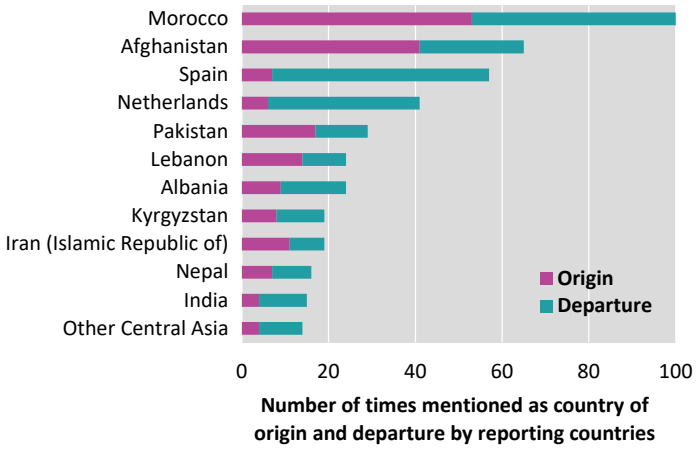
Cannabis resin produced in Afghanistan is mostly trafficked to neighbouring countries.[29] Other key trafficking

FIG. 10 Quantities of cannabis resin seized, by country, 2020



Source: UNODC, responses to the annual report questionnaire.

FIG. 11 Main countries of origin and departure of cannabis resin as reported by Member States, 2016–2020



Source: UNODC, responses to the annual report questionnaire.

Note: The category "Other Central Asia" includes Kazakhstan and Tajikistan.

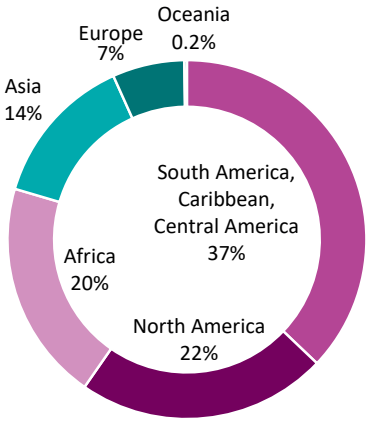
flows include routes through Central Asia, mainly for destinations within the subregion and the Russian Federation, as well as routes from production areas in Lebanon, to other countries in the Near and Middle East and Europe.

Americas report most cannabis herb seizures, but lower interception rates lead to strong decline in seizure figures

The Americas reported almost 60 per cent of global cannabis herb seizures in the period 2016–2020. However, the overall share of the Americas for cannabis herb seizures has declined significantly, falling from 84 per cent of the global total in 2010 to 58 per cent in 2020.

The positive correlation between drug use and drug seizures in North America disappeared over the course of the last decade, during which time cannabis seizures decreased by 84 per cent despite the significant expansion of the cannabis market. Seizures were down 76 per cent in the United States alone over the period 2010–2020, even though the number of people using cannabis on a daily or near-daily basis rose by almost 130 per cent.[30]

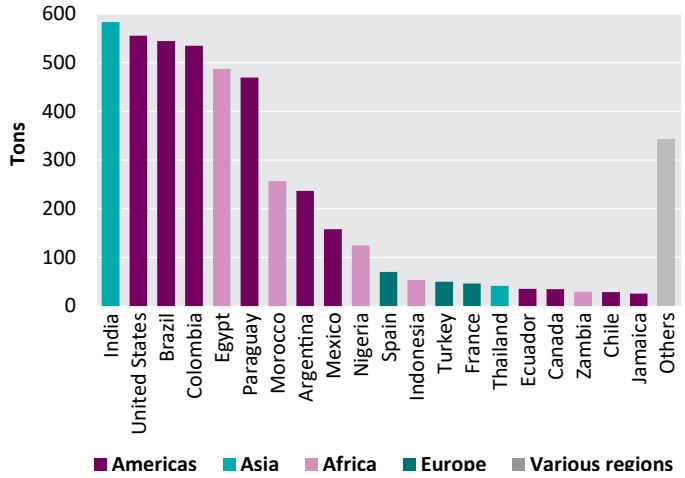
FIG. 12 Distribution of quantities of cannabis herb seized, 2016–2020



Source: UNODC, responses to the annual report questionnaire.

This divergence between seizures and use trends in the United States and Canada suggests lower cannabis interception rates, mainly the result of changes in laws that legalized the supply of cannabis for non-medical use in several jurisdictions, as well as possibly the lower

FIG. 13 Quantities of cannabis herb seized by country, 2020



Source: UNODC, responses to the annual report questionnaire.

priority given by law enforcement authorities. Moreover, the legalization of cannabis supply for non-medical use in some jurisdictions has reduced the size of the illegal cannabis market and therefore decreased seizures.[e] Mexico also reported a strong decline in seizures as higher potency cannabis became widely available in the United States and organized criminal groups shifted their focus to other drugs.[31]

Increasing health harm of cannabis in Western and Central Europe

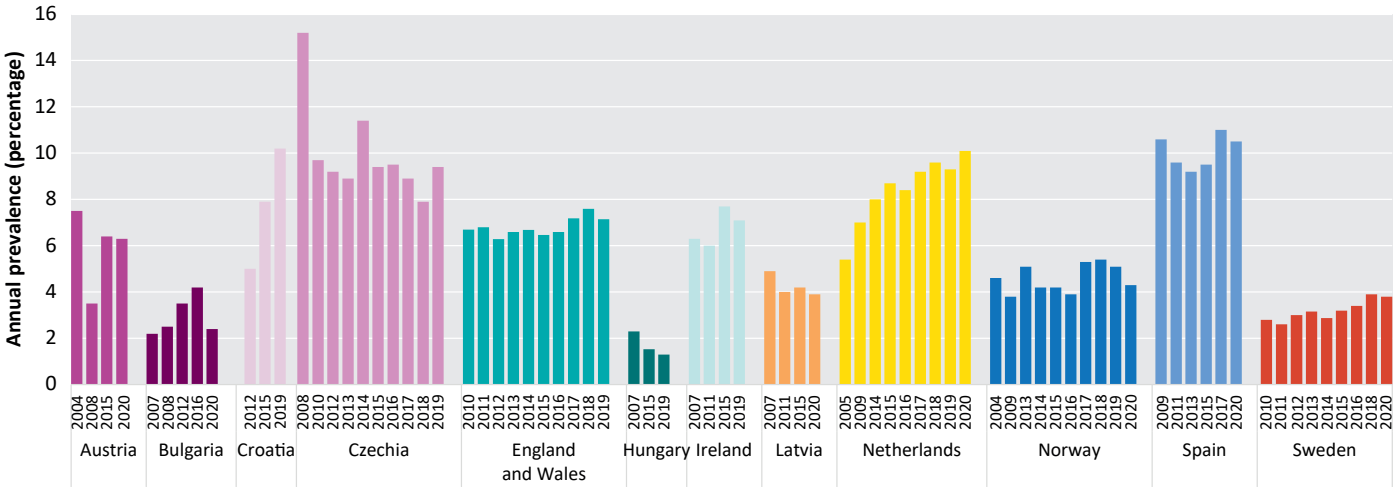
Around 29 million people are estimated to be past-year users of cannabis in Europe. Annual prevalence of cannabis use in Western and Central Europe has fluctuated between 6 and 8 per cent over the past decade (2010–2020). Among the countries in Europe that have reported recent survey data, many countries indicate a trend of an increase in cannabis use in recent years.

Cannabis use in the European Union reflects the global trend for a higher prevalence among adolescents and young adults (15–24 years old), with past-year use among this age group estimated at 19.2 per cent.[32]

Based on data from 26 Western European countries,[f] both the number of people regularly using and the frequency of cannabis use has increased: past-month prevalence among the adult population (15–64)

e See the section of the present Booklet, *Cannabis legalization*.

FIG. 14 Trends in cannabis use among countries in Europe that reported recent data in 2020



Sources: UNODC, responses to the annual report questionnaire; and EMCDDA, "Statistical Bulletin 2020: prevalence and patterns of drug use in the general population".

f In this section, Europe refers mostly to member States of the European Union, Norway, Switzerland, and the United Kingdom.

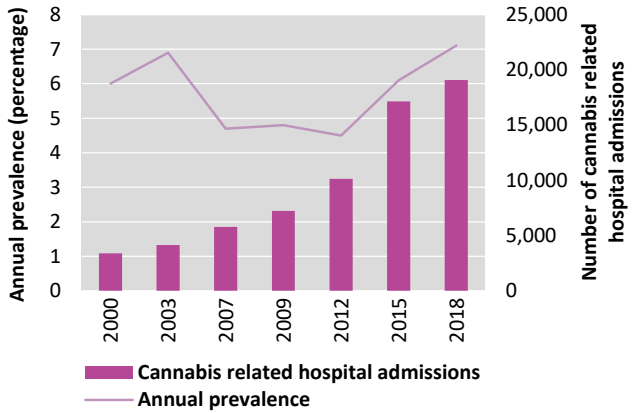
increased by 27 per cent to 3.9 per cent in the period 2010–2019;[33] the proportion of daily or near-daily users also increased to 1.8 per cent, mostly among young people, in 2019, compared with approximately 1 per cent earlier.[g, 34]

At the same time, the potency of cannabis products available in Europe has also increased. Between 2010 and 2019, THC content in herbal cannabis increased by 40 per cent and that of cannabis resin nearly tripled.[35]

With these dynamics – increase in exposure to high-potency cannabis products, regular and frequent cannabis use – harms related to the use of cannabis are increasingly apparent in the general population in Western and Central Europe.[36] There has been a notable increase in treatment admissions related to cannabis use and psychiatric comorbidities. Between 2010 and 2019, in the European Union, the rate of people entering treatment with cannabis as their primary drug increased from 27 to 35 per 100,000 of the adult population. In 2019, around 35 per cent of all people who entered specialized drug treatment services in the European Union were for treatment of cannabis use. More than half of first-time clients were using the drug daily. Cannabis was also the most common substance of use reported in emergency rooms,[h] where it was present in 26 per cent of acute drug toxicity cases, usually alongside other substances.[37]

In a case-control study conducted at 11 sites in Brazil England, France, Italy, the Netherlands and Spain[i] involving patients presenting first episode psychosis and adult population from the same places, cannabis use was associated with a three times greater likelihood of psychotic disorder compared with individuals who had never used the drug; daily use of high-potency cannabis (more than 10 per cent THC) increased the risk of psychotic disorder more than fourfold compared with the risk for those who had never used cannabis.[38, 39, 40, 41]

FIG. 15 Trends in cannabis use and cannabis-related hospital admissions in Germany 2000–2018



Source: UNODC, responses to the annual report questionnaire; EMCDDA, "Statistical Bulletin 2020: prevalence and patterns of drug use in the general population", and Gahr et al., "Incidence of Inpatient Cases with Mental Disorders Due to Use of Cannabinoids in Germany."

As a country-level example, an increase in cannabis use and much higher increase in cannabis-related harms have been observed in Germany. The past-year cannabis use has increased, especially since 2013, by 50 per cent. Meanwhile, admissions related to mental and behavioural disorders due to cannabis use increased considerably between 2000 and 2018, as have admissions related to cannabinoid dependence and withdrawal, which were up more than eightfold, and admissions for cannabis-related psychotic disorders, which have more than quadrupled.[42]

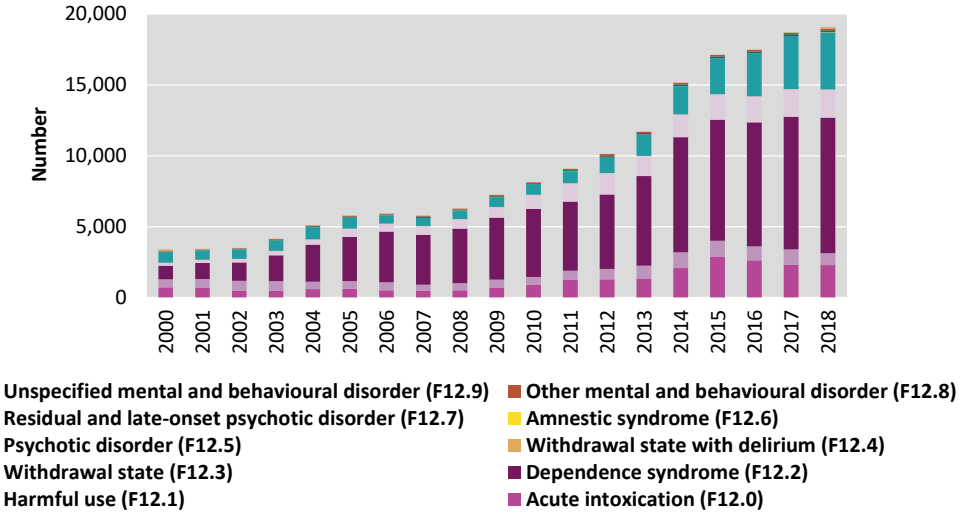
The increase in the number of inpatient cannabis-related cases in Germany has been attributed to many factors, including the debate on the legalization of cannabis; amendments to the Narcotics Law and other regulations in 2017 that expanded options for physicians to prescribe cannabis-based products under certain conditions; and increased availability of cannabis-based products with high THC (and low CBD) content and synthetic cannabinoids. All of these factors may have contributed multiplicatively to the increase in the number of cases of hospitalization due to cannabis use disorders, more than just contributing

g 61 per cent of the daily or near daily users are estimated as people under 35 years of age.

h This is based on reporting from 23 hospitals in 17 countries that participated in the EURO-DEN Plus Network.

i The study was implemented between May 2010, and April 2015, in 11 sites in England, France, the Netherlands, Italy, Spain and Brazil. The cases included 901 patients with first episode psychosis and 1237 population controls from those same sites. The participants were aged 18-64 years and included an equal number of men and women.

FIG. 16 Cannabis-related inpatient cases in Germany, 2000–2018



Source: Based on data given in table 2 of Gahr et al., "Incidence of Inpatient Cases with Mental Disorders Due to Use of Cannabinoids in Germany".

Note: The inpatient cases are classified according to ICD-10 F codes (due to specific mental and behavioural disorders due to cannabinoid use).

to the increase in the number of people using cannabis in Germany.[43, 44, 45]

Africa remains the only region where cannabis accounts for most drug treatment demands

Annual prevalence of cannabis use in Africa in 2020 is higher than the global average and estimated at 6.5 per cent of the population aged 15–64. West and Central Africa have the highest prevalence of use in the region at 9.7 per cent, to a large extent reflecting past-year use of cannabis in Nigeria.[46] Half of all people treated for drug use disorders in Africa in 2020 were treated for cannabis as the primary drug of concern (a far higher proportion than in any other region), with the figure rising to 55 per cent in West Africa, or almost 3 per 100,000 of the adult population.[47] In North Africa, around one third of all people treated for drug use disorders were treated for cannabis use disorders.[48] In South Africa, over one third of attendees of specialist drug treatment services in 2020 were being treated for cannabis as the primary or secondary drug of concern.[49] Most of those people were aged 20 or younger.

Developments in measures regulating the non-medical use of cannabis

As of January 2022, legal provisions allowing the production and sale of cannabis for non-medical use have been approved in Canada and Uruguay, as well as in 21 jurisdictions of the United States (18 states, two territories and the District of Columbia). Canada and most of the 21 jurisdictions in the United States allow for production and sale by for-profit industry, while in Uruguay there is a partially controlled and state-regulated retail market. There are differences in the level of regulation and control from jurisdiction to jurisdiction, which is likely to have varying impacts on cannabis use and related harms and public health and safety outcomes.[j]

j For more information on cannabis regulations in each jurisdiction in Canada, the United States and Uruguay, see table at the end of the present chapter and previous WDRs.

Rising THC and falling CBD levels in cannabis amplify health risks

Despite a decline in 2019, there is a clear long-term trend of increased THC content in seized cannabis herb in Europe and the United States.[i] Average THC content of cannabis herb seized in Europe has increased by almost 40 per cent since 2009, and that of cannabis resin tripled,[ii] while the potency of cannabis herb seized in the United States rose by close to 50 per cent (to 14.35 per cent) over the same period.[iii] In some jurisdictions that have legalized the non-medical use of cannabis, most cannabis products now have THC contents greater than 20 per cent and cannabis concentrates have THC content of up to 70 per cent.[iv]

Some of this increase in THC content is attributable to the growing importance of indoor cultivation of high-potency cannabis, which has led to a shift in the cannabis market in Europe from imported cannabis resin from Morocco to increasingly potent cannabis herb grown locally in greenhouses in Western and Central Europe,[v] and, in the United States, a shift from imported herbal cannabis from Mexico to local production for domestic consumption.[vi]

The rising THC content and falling CBD content in cannabis in Europe and North America are more harmful. A reduction of CBD in relation to THC in cannabis products may heighten health risks because there are indications that CBD may mitigate some of the psychoactive effects of THC on the human body. An increased ratio of THC can increase dependency and the chances of psychiatric comorbidities.[vii]

[i] National Institute on Drug Abuse, "Marijuana Potency," National Institute on Drug Abuse, April 1, 2021.

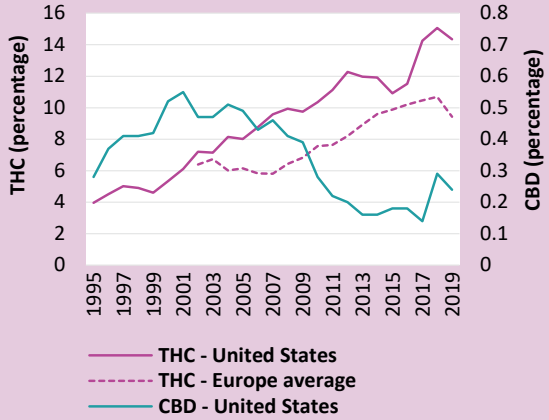
[ii] UNODC estimates based on EMCDDA, "Statistical Bulletin 2021, Price, Purity and Potency; and UNODC, responses to the annual report questionnaire.

[iii] National Institute on Drug Abuse, "Marijuana Potency."

[iv] Mary Catherine Cash et al., "Mapping Cannabis Potency in Medical and Recreational Programs in the United States," ed. Tally Largent-Milnes, *PLOS ONE* 15, no. 3 (March 26, 2020): e0230167, https://doi.org/10.1371/journal.pone.0230167.

[v] EMCDDA and Europol, *EU Drug Markets Report 2019* (Luxembourg: Publications Office of the European Union, 2019).

Cannabis potency (Δ9-THC content) and CBD in cannabis herb in Europe and the United States



Sources: National Institute on Drug Abuse, "Marijuana Potency" (April 2021), based on University of Mississippi, National Center for Natural Products Research, Research Institute of Pharmaceutical Sciences, Potency Monitoring Program, "Potency of Cannabis Samples Seized by the Drug Enforcement Administration (DEA), Percent Averages from 1995-2019" (Quarterly Report 146); UNODC calculations based on EMCDDA, Statistical Bulletin 2021–Price, Purity and Potency; and UNODC, responses to the annual report questionnaire.

Note: Europe refers here to countries of the European Union, Norway, Switzerland, and the United Kingdom.

[vi] UNODC, responses to the annual report questionnaire.

[vii] University of Western Ontario. "Cannabis Study Reveals How CBD Offsets the Psychiatric Side-Effects of THC," September 30, 2019, *ScienceDaily* (30 September 2019) based on Hudson, Roger, Justine Renard, Christopher Norris, Walter J. Rushlow, and Steven R. Laviolette. "Cannabidiol Counteracts the Psychotropic Side-Effects of Δ-9-Tetrahydrocannabinol in the Ventral Hippocampus through Bidirectional Control of ERK1–2 Phosphorylation." *The Journal of Neuroscience* 39, no. 44 (October 30, 2019): 8762–77.

Developments in cannabis regulation other than the legalization of the entire supply chain

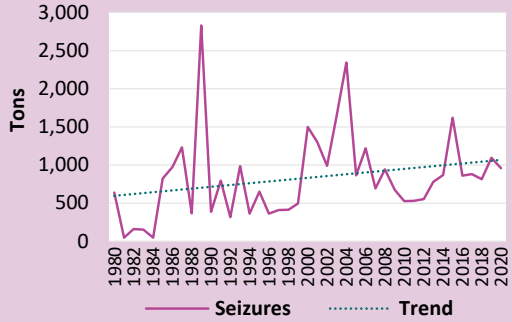
There are other developments which, in various forms and legislative measures or practices, allow some cultivation or sale of cannabis for non-medical use in a number of countries. These practices differ from full legalization as they do not allow the same level of cannabis commercialization as approved in Canada, Uruguay and the 21 jurisdictions in the United States. This section describes some of these measures and provides examples in selected countries.

The cultivation of cannabis for personal use has, in the past, characterized so-called "cannabis clubs" in some European countries, in particular Spain and Belgium. Cannabis social clubs are typically non-profit associations of adult cannabis users who collectively cultivate, produce and distribute cannabis among themselves, on the basis that one adult can cultivate one or a small number of plants for personal use. In

Trafficking trends in cannabis herb difficult to identify in Africa

Trends in trafficking of cannabis herb in Africa remain difficult to identify on the basis of seizure data due to large fluctuations in the reporting by Member States and, in some countries, the lack of proper differentiation by law enforcement authorities between seizures of cannabis herb and plants. Cannabis herb seizures in Africa accounted for 20 per cent of the global total in the period 2016–2020, most of which were reported by countries in North Africa (60 per cent of all cannabis herb seized in Africa) and West and Central Africa (33 per cent). But this reflects the higher rate of reporting data in North African countries. However, if a longer period is considered, in order to increase data coverage, West and Central Africa have a share of seizures similar to North Africa.

Cannabis herb seizures reported from Africa, 1980-2020



Source: UNODC, responses to the annual report questionnaire.

some models, the social club produces cannabis for the members.[50, 51]

In the Netherlands, it is illegal to possess, sell or produce drugs, including cannabis. However, the Netherlands has a policy of tolerating the sale of cannabis for personal use in coffee shops, which have been able to sell small quantities of cannabis for personal consumption since 1970.[52] As the cultivation and sale of cannabis is not permitted, coffee shops have obtained their cannabis from illegal sources. Coffee shops are licensed by municipalities, although only about one third allow such shops to operate.[53] To combat drug-related crime and nuisance, as of 1 January 2013, only residents of the Netherlands (living and registered in a Dutch municipality) may visit coffee shops and purchase cannabis there. How actively this rule is enforced differs from municipality to municipality.

In December 2021, the Government of Malta passed a law on "responsible use of cannabis". The law allows people aged 18 years and older to possess up to 7 g of cannabis, domestic cultivation of up to four cannabis plants and the storage of up to 50 g of dried cannabis product. In addition, people can form Non-Profit Organisations with a Risk and Harm Reduction approach[k] for the purpose of cultivating cannabis exclusively for the organization's members in a collective manner. Such organisations may distribute the cultivated cannabis only to its members, similar to the cannabis clubs described above. The law also foresees creating a regularized and safe source from which a person can obtain cannabis and cannabis seeds in limited and controlled amounts, under strict conditions.[54] Under the law, possession of cannabis in any amount for personal consumption by people under the age of 18 is decriminalized, and those found in possession of cannabis now go before a commission for justice for the recommendation of a care plan rather than facing arrest.[55]

In 2018, the Constitutional Court of South Africa[56] ruled that the use and possession of cannabis, and the cultivation of cannabis plants by an adult in private, for that adult's personal consumption in private is no longer a criminal offence. This ruling was in recognition of the constitutional right to privacy enshrined in the Constitution. Adults[l] may now use and possess cannabis and cultivate cannabis plants in quantities that are sufficient for their personal consumption in any private, non-public place.

k Non-Profit Organizations with a Risk and Harm Reduction approach are non-profit by design, aiming to move away from the commercialization of cannabis, and instead serve to provide a safe space for the consumption of cannabis, while also allowing for quality control, regulation and monitoring by the Authority on the Responsible Use of Cannabis of Malta.

l Adults in the South African population are considered those 18 years and older.

Terminology used for the legal status of cannabis

What do the conventions prescribe for cannabis?

The international drug conventions do not define the concepts of "depenalization", "decriminalization", and "legalization", but these terms are often used in the drug debate, particularly in the context of cannabis. They nonetheless contain provisions "to address drug-related behaviours, including the commission of serious offences, the commission of offences of a lesser relative gravity and the commission of offences by persons who use drugs".[i]

As a general obligation, the international drug control conventions of 1961 and 1971 require States parties to establish measures to limit the production, manufacture, export, import and distribution of, trade in, and possession of controlled drugs, exclusively to medical and scientific purposes, subject to the provisions of those conventions.[ii] As a substance subject to control under the 1961 Convention, these provisions also apply to cannabis.

Accordingly, any of the above-mentioned activities conducted for non-medical and non-scientific purposes are inconsistent with the legal obligations of the State parties to the conventions. The international drug control conventions do not require States parties to establish criminal offences for drug use. The INCB has recently clarified that "measures to decriminalize the personal use and possession of small quantities of drugs are consistent with the provisions of the drug control conventions".[i]

Decriminalization is defined by INCB as "the process through which an offence is reclassified from "criminal" to "non-criminal" through legislative action"; while the behaviour remains an offence, it may be addressed through other means than criminal law.[iii]

Legalization is frequently associated with the regulation and commercialization of controlled drugs, such as cannabis, for non-medical and non-scientific purposes entailing no penalty (whether criminal, administrative, civil or otherwise) for production, manufacture, export, import and distribution of the drug.

Decriminalization and legalization are quite distinct concepts, as decriminalization in the context of minor drug offices is within the provisions of the international drug conventions, legalization is not.[iv]

The term **depenalization** has been used in different contexts and languages with different meanings.[iii] According to INCB, a depenalization approach may include: "police diversion practices, conditional sentences and the widening of prosecutorial discretion as an alternative to criminal prosecution". Depenalization differs from decriminalization since it refers to situations where certain conducts, for example cannabis possession and trade, remain criminal offences but with a reduction in the use of existing criminal sanctions. In contrast to decriminalization, depenalization may not require a change in the legal framework.

INCB highlights the flexibility afforded to States within the drug control conventions to make differentiated policy choices and adopt legal frameworks which avoid disproportionate responses to drug-related behaviours of a minor nature or when committed by people who use drugs,[v] while ensuring effective responses to serious drug-related behaviours.

[i] See paragraph 371 in INCB, *Report of the International Narcotics Control Board for 2021* (E/INCB/2021/1).

[ii] See article 4(c) of the 1961 Convention and article 5(2) of the 1971 Convention.

[iii] See paragraph 378 in INCB, *Report of the International Narcotics Control Board for 2021* (E/INCB/2021/1).

[iv] See paragraphs 376 and 377 in INCB, *Report of the International Narcotics Control Board for 2021* (E/INCB/2021/1).

[v] See paragraphs 380 and 381 in INCB, *Report of the International Narcotics Control Board for 2021* (E/INCB/2021/1).

In the Netherlands and Switzerland, laws have recently been passed to regulate scientific experiments on cannabis. In July 2020, the Government of the Netherlands extended its regulations to allow an experiment with cannabis cultivation and production for supply to coffee shops.[57] This "closed coffee shop chain experiment" (also known as the "weed experiment") will permit 10 growers to legally produce cannabis to supply coffee shops in 10 participating municipalities.[58] Coffee shops in these municipalities will be able to sell cannabis produced by these cannabis farms during the experiment. The experiment will run for four years and will be independently evaluated to observe the effects on public health and crime.[59]

In 2021, Switzerland passed the Ordinance on Pilot Trials under the Narcotics Act (BetmPV), which provides the legal framework for the regulated sale of cannabis. Cantons, municipalities, universities and other organizations will be able to conduct pilot trials to gain scientific knowledge about alternative approaches to regulating the non-medical use of cannabis. Only adults who can prove that they already use cannabis will be eligible to participate. The trials will

also test different cannabis products that have varying THC/CBD contents.[60]

Analyzing the impact of cannabis legalization

A combination of drivers, public policy concerns and ambitions have led to countries and state-level jurisdictions in Canada, the United States and Uruguay legalizing the entire cannabis supply chain and adopting measures allowing the production and sale of cannabis for non-medical use by commercial and for-profit entities.

Those concerns or aspirations include:

- Permitting non-medical use of cannabis among adults while preventing its use among adolescents
- Addressing criminal justice responses because treating the possession of cannabis for personal use as a criminal offence had led to many people being arrested and acquiring a criminal record, with ethnic minorities being disproportionally affected by such policies in countries such as the United States
- Establishing a regulated market to ensure product quality (THC content) and prevent the use of hazardous contaminants in production
- Preventing organized crime groups from generating profits from the illicit trade in cannabis
- Reducing both law enforcement costs, especially the policing of possession for personal use of cannabis, thus freeing up resources to address more serious crimes
- For governments and authorities themselves to generate revenue from the cultivation, production and sale of cannabis, depriving organized crime groups of income and investing part of the revenue in prevention of substance use and treatment of drug use disorders, thus protecting public health and safety.[61, 62, 63]

Any attempt to assess the impact of cannabis legalization would include the review of some of those desired outcomes.

IMPACT OF CANNABIS LEGALIZATION

Caveats in assessing the impact of cannabis legalization

In assessing the impact of cannabis legalization, there are several issues that need to be taken into consideration.

There are *systematic differences* within countries and different contexts within jurisdictions that have legalized cannabis. Thus, comparing outcomes across jurisdictions **do not offer a natural experiment** and it doesn't inform about the impact of cannabis legalization. Looking at changes in an indicator relative to before and after in jurisdictions that have legalized cannabis versus those that have not can also be misleading because trends in an indicator can be independent of legalization status.

Many trends observed in outcome measures in countries and states that have legalized cannabis **cannot be simply taken out of context, nor can those measures be replicated** in other countries as such. In different jurisdictions, the degree of development of the cannabis market, social constructs and existing policies could differently mitigate or exacerbate the impact of cannabis legalization.

Importantly, the full effects of legalization on public health, safety and criminal justice **will take decades to become apparent**. In most jurisdictions, cannabis production and supply chains are being developed and have not yet stabilized. A few years after the legalization of non-medical use of cannabis may not be long enough to provide an adequate indication of the impact of cannabis use on public health as cannabis markets are still developing.[i]

Implementing a policy of cannabis legalization is not an on/off light switch, although the typical research study design imagines that to be the case. The movement towards legalization has, in many jurisdictions, been a generational and continuous evolution. In most states of the United States and in Canada, the path towards legalization came through initiatives allowing medical use of cannabis, and those initiatives had varying degrees of permissiveness and restriction. For example, the first two states of the United States to legalize cannabis, Colorado and Washington, even before the public voted for legalization in 2012, had medical cannabis dispensaries that sold cannabis products. Thus, the legal supply of cannabis predated de facto formal legalization, and that could have had a greater impact on the extent of cannabis use than did the subsequent formal legalization.

There are also **methodological challenges** in monitoring outcomes of cannabis legalization such as the health impact of cannabis.

- The prevalence and frequency of cannabis use as reported in general population surveys is in essence self-reported behaviour and has a degree of underreporting, a phenomenon also seen in the case of alcohol use. The legal status of a substance affects people's willingness to self-report such behaviour. In addition, there can be challenges in capturing or measuring the use of the wide range of cannabis products that have been introduced in the market, such as edibles, concentrates and vaping: the usual survey question of "Have you used marijuana?" may be interpreted by some respondents in a narrower sense, that is, that it refers only to smoking cannabis herb.
- Reporting of cannabis poisoning cases, especially among children, can be straightforward, whereas statistics on emergency room visits and hospitalizations attributed to cannabis use among adults can reflect both the actual change in people suffering from a condition as a result of cannabis consumption and the degree to which people are willing to report to and utilize health-care services.
- Measuring blood levels of THC to monitor impaired driving could be misleading because peak impairment does not occur when THC concentration in the blood is at or near peak levels. In addition, concurrent use of alcohol and cannabis can cause a higher degree of impairment than cannabis alone.

Assessing cannabis legalization is a complex undertaking and existing literature should be read with a critical approach. Cannabis legalization can potentially affect areas of interest such as public health or public safety, differently, with some favourable effects in some areas and unfavourable effects in others. Given the polarization of views on cannabis legalization, advocates are often selective in how they aggregate or combine different indicators to focus exclusively on outcomes whose trends favour their pre-existing conclusions.

[i] Wayne Hall and Michael Lynskey, "Assessing the Public Health Impacts of Legalizing Recreational Cannabis Use: The US Experience," *World Psychiatry* 19, no. 2 (June 2020): 179–86, https://doi.org/10.1002/wps.20735.

TABLE 1 **Impact of cannabis legalization: an overview**

Domain	Changes observed after legalization (temporal sequence/outcome/impact)	Is it a clear trend in all jurisdictions where cannabis has been legalized or is it a local trend?	What does the evidence reveal about the impact of legalization?
Public health			
- Adult use	General increase in cannabis use, with a narrowing gender gap and a more pronounced increase in frequent use among young adults	A general increase in cannabis use is observable in the United States, Canada and Uruguay. In Canada in 2021, there was a first sign of decrease in past-year and past-month use, but not in daily use; and after legalization, the perception among users that cannabis is an addictive drug increased.	Each country and jurisdiction that has legalized cannabis started with a different level of cannabis use and thus the impact of legalization on the extent of use among adults may be different. In jurisdictions in the United States and Canada, cannabis use started to increase before cannabis was legalized, mostly when laws allowing medical cannabis made cannabis widely available including for recreational use. While the change in prevalence after legalization is clear, that change may only partially reflect the impact of legalization. Legalization may have simply accelerated a dynamic that had begun earlier. In fact, the legalization of cannabis may be partly the result, rather than the cause, of the expansion of the cannabis market, occurring at the same time as a decrease in the risk perception of cannabis use and an increase in regular use. However, in Canada, after legalization, people using cannabis had an increasing perception of the addictive nature of cannabis.
- Use among adolescents	While cannabis use remains high among the cohort of adolescents in the United States and Canada as compared to other countries, it is generally stable or decreasing. However, daily use and vaping are increasing.	Cannabis use among adolescents increased in Uruguay, while in the United States and Canada, it is either decreasing or stable, although it remains comparatively high among the cohort of adolescents who were surveyed.	
- Use among women of reproductive age, especially use among pregnant women	Cannabis use among women of reproductive age, including prior to, during and after pregnancy, continued to increase after legalization, but increased more strongly in states that have legalized cannabis (where a higher level of cannabis use among women of reproductive age, including pregnant women, was already visible before legalization).	Evidence on trends in and levels of cannabis use among women of reproductive age, including pregnant women, before and after legalization, is available in the United States, where this is regularly monitored.	The more marked increase in cannabis use among women of reproductive age and during pregnancy observed in states where cannabis was legalized may be explained only partially by the legalization per se since the increasing trend and the higher level of use in legalizing states predated legalization. The increase in cannabis use is in large part due to a decreasing risk perception of cannabis use and to self-medication during pregnancy.
- Harmful use of cannabis and health consequences	After a sharp increase during the years following legalization, cannabis-related emergency department visits and hospitalizations have stabilized. Emergency department visits related to edibles have had the largest increase, especially for children. There is an increasing trend in cannabis use disorders that likely started in the years before legalization; there is also an increase in the proportion of people with psychiatric disorders and suicides associated with regular cannabis use.	Evidence on cannabis-related hospitalizations and emergency department visits before and after legalization are available for two jurisdictions in the United States, Colorado and California, and for Canada. Evidence on cannabis use disorders, depression and suicide is available for the United States and Canada.	A "simultaneous quadruple confluence" of increasing prevalence of use, increase in intensity (frequency and quantities) of use, increasing THC content of cannabis products and increasing hospitalization due to cannabis use and cannabis use disorders, have all likely interacted multiplicatively after legalization, and it is challenging to extract the net impact of legalization on each factor. The sharp increase related to edibles suggests that legalization has directly opened up access to more harmful cannabis products that have increased the overall health harm of cannabis. The much sharper increase in the proportion of cannabis present in increasing suicide deaths as compared to alcohol also suggests that the overall health harm of cannabis has followed the same patterns of use that started to increase before legalization, with legalization probably only accelerating and exacerbating the pre-existing underlying trend.

Domain	Changes observed after legalization (temporal sequence/outcome/impact)	Is it a clear trend in all jurisdictions where cannabis has been legalized or is it a local trend?	What does the evidence reveal about the impact of legalization?
Substitution/complementarity with alcohol and tobacco	No decrease observed in alcohol use where cannabis was legalized, while tobacco use has declined in a fairly uniform manner across the entire United States regardless of cannabis regulations.	Evidence on a possible substitution effect is limited and that is available only for the United States	The evidence available on the possible substitution effect after legalization remains inconclusive. The limited evidence suggests that legalization may have brought complementarity rather than substitution.
Cannabis market			
- Products, potency and prices	There has been a clear diversification of cannabis products, with very potent products such as concentrates and edibles entering the market after legalization. Average THC level in cannabis has continued to increase after legalization, together with a decreasing level of CBD.	The increased THC and decreased CBD levels in cannabis can be observed across the United States, with products in Colorado found to have a THC content of up to 79 per cent. Diversification of cannabis products is also observed in Canada. In Uruguay, the THC content, and the range of cannabis products, have largely remained stable at lower levels than in the United States and Canada.	While it is not possible to determine the causality between legalization and the diversification of cannabis products and increased potency, it is worth considering whether the way legalization happened in the United States and Canada has favoured commercial interests and the diversification of the market, similar to alcohol and tobacco. Products such as edibles also make cannabis use more palatable compared with smoking. A more regulatory approach, especially of THC content, as adopted in Uruguay may have prevented this diversification in this country.
- Size of the illicit market	The illegal cannabis markets still exist after legalization, but to varying extents, in the different countries and jurisdictions that have legalized cannabis. In some countries, the size of the illegal market has decreased since the new regulation was put in place.	The recorded extent of the illegal market that remains after legalization varies, from around 40 per cent in Canada to nearly 50 per cent in Uruguay and 75 per cent in California. In Uruguay, the discrepancies between the number of people registered and those estimated to have used cannabis in the past month suggest a substantial gap in the legal market meeting the demand from regular users.	Legalization has not so far displaced the illegal cannabis markets in the jurisdictions where cannabis has been legalized, although the space for the illegal market is decreasing in some jurisdictions. The illegal market remains attractive for different reasons, including price, quality and accessibility. In some jurisdictions, the percentage of cannabis that is sold in the illegal market continues to decrease, and it is not currently possible to determine whether certain models for cannabis legalization are more likely to reduce the size of the illegal market and whether legalization can ever entirely eliminate the illegal market.
- Taxes and revenues	Tax revenues from the legalized cannabis market have continued to increase. A varying part of the revenue has been invested in prevention of substance use and treatment of drug use disorders.	Cannabis-related tax revenues have increased in all jurisdictions where cannabis has been legalized. These annual revenues vary from 1.5 billion (Canadian dollars) in Canada to $4.4 billion in California. Cannabis tax revenues, however, account for only a small fraction of the total tax revenues of states.	Legalization has had a clear impact in terms of the amount of taxes collected from the cannabis market and has added a new resource to the budgets of jurisdictions that have legalized cannabis. Nevertheless, the revenue collected through these taxes is proportionately small.
Public safety			
- Driving under the influence - Traffic fatalities	An increase in driving under the influence of cannabis and cannabis-related fatal car accidents has been observed across the entire United States. No significant change has been observed in the attitude of people towards driving 2–3 hours after consuming cannabis. Drug-impaired driving and treatment admission for driving under the influence of cannabis has continued to increase after legalization.	An increase in cannabis-related fatal car accidents has been observed across the United States with no significant difference between states that legalized cannabis and those that did not. Evidence on attitudes towards driving after consuming cannabis is available for the United States and Canada. An increase in cannabis-impaired driving was observed in Canada, and an increase in treatment admissions for cannabis-impaired driving was recorded in Colorado.	Notwithstanding methodological issues in measuring impairment of drivers due to cannabis use and the influence of other substances such as alcohol, the evidence available on the impact of cannabis legalization on cannabis-related driving accidents is mixed and inconclusive. Evidence suggests that the clear increase in traffic fatalities in a United States state such as Colorado was not caused by legalization, while the increase in drug-impaired driving that started before legalization has been attributed at least partially to increased detection and monitoring of people driving under the influence of cannabis.

Domain	Changes observed after legalization (temporal sequence/outcome/impact)	Is it a clear trend in all jurisdictions where cannabis has been legalized or is it a local trend?	What does the evidence reveal about the impact of legalization?
- School discipline	Cannabis-related infractions in school remained after legalization the main reason for which students have been expelled, suspended or referred to law enforcement authorities. Trends after legalization are mixed and variable. After a stable or declining trend immediately after legalization, drug-related school suspensions showed some increase.	Trends in drug-related school discipline were monitored in the States of California and Colorado.	Cannabis legalization does not seem to have led to changes in sanctions given by schools to students due to drug and cannabis use. The limited evidence available suggests that, if anything, cannabis legalization has increased the number of drug- and cannabis-related school sanctions given.
Criminal justice response - Arrests and prosecution for possession for personal use	After legalization, there has been a significant decrease in total arrests for cannabis-related offences: a sharp decrease for adults, but a small and insignificant reduction for youth. A reduction in arrests is discernible for all races, but the racial disparities in arrests have widened after legalization.	A decline in cannabis-related arrests is visible in all United States jurisdictions that have legalized non-medical use of cannabis. States of the United States that implemented cannabis decriminalization have significantly reduced the rate of youth arrests, while States that legalized cannabis have not significantly reduced youth arrests.	The decline in persons arrested for cannabis offences, especially possession for personal use, in states that have legalized cannabis became visible the year after legalization, as a direct impact of legalization that took away the criminal basis for arresting people found to be in possession of or trafficking cannabis. However, with cannabis offences still in force for minors, legalization has not had any impact on the arrests of youth. It is possible that with legalization for adults, police have focused on youth.
- Violent and property crimes	No clear changes in trends can be observed after legalization in crime rates not related to cannabis. An increase in violent crime around cannabis dispensaries, particularly in low-income neighbourhoods has been recorded.	Legalization in the United States took place in the context of overall declining crime trends, and, in Canada, of an overall increase (albeit following several years of decreases). After legalization, there have been mixed trends in the United States, with increases in some states that legalized cannabis and decreases in others. Studies on crimes affecting communities around cannabis dispensaries provide evidence for the States of Washington and Colorado.	There is no visible impact of legalization on overall crime rates, although overall rates may mask significant changes at the state or community level. The very limited evidence available on crime affecting communities around cannabis dispensaries suggests that the cash-based cannabis economy may increase the risk of burglaries in dispensaries and clients being robbed. Crime rates in a jurisdiction may be more greatly influenced by sociodemographic factors and economic status, as well as differential policies and law enforcement milieu in those jurisdictions than merely by legalization.
Commercial interests - Involvement of big corporations in cannabis supply chains	The legal cannabis industry has flourished after legalization, with the growing influence of, and investment by, large corporations.	Evidence of large corporations that are investing in the cannabis sector was particularly visible in Canada and California.	Legalization has led to a new cannabis industry, attracting the interest of large corporations, which see the potential for growth and opportunity for investment.
- Entry into cannabis supply chains of corporations involved with tobacco and alcohol supply	There is an increasing interest and investment in the cannabis industry from the alcohol and tobacco industries, and vice versa.		As happened before in the tobacco and alcohol industries, the expansion of a large corporate interest in the cannabis industry has likely resulted in concerted efforts to monopolize the market, advocating for the expansion of the cannabis market, and a proliferation of products targeting an increased base of regular users.
Conclusions			
The evidence available to assess the impact of cannabis legalization in some jurisdictions in the Americas remains patchy and not yet definitive. The period is too short to assess long and enduring changes, and the specific characteristics of the cannabis market as it existed before legalization makes it difficult to assess the net impact of the new regulations. Most of the observable trends and lessons learned remain specific to the context of the jurisdictions where legalization took place and are not easily applicable to other countries and regions where the same regulation could have a different, disproportionate effect on the elements of public health, public safety, the criminal justice response, the cannabis market and commercial interests that are analysed here.		

Assessing the impact of cannabis legalization

The following section presents data and information that underpin the overview presented above. The discussion on selected key elements is neither all-encompassing nor conclusive but is illustrative of different outcomes of a particular area of interest of cannabis legalization.

Public health

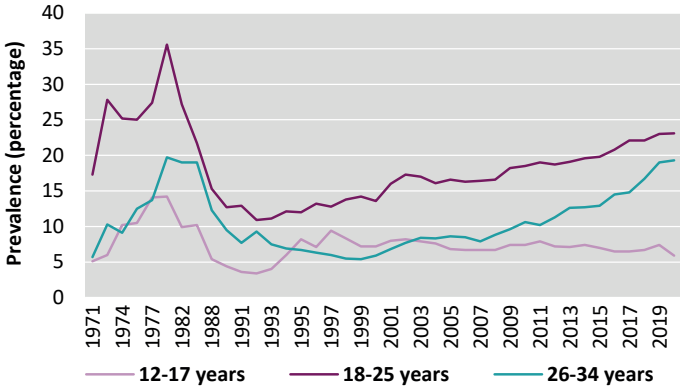
Changes in the extent of cannabis use among the adult population

Cannabis use and frequency of cannabis use have increased in the countries and state level jurisdictions that have legalized non-medical use of cannabis.

In the United States and Canada, the increase in cannabis use started long before legalization. In the United States, a clear expansion of the cannabis market started in 2007/08, long before the first state legalized cannabis, with the main increase being observed in the daily and near-daily use of cannabis and among those aged 18–25 years and those aged 26 years or older.[64] As a long-term trend, past-month cannabis use declined after a peak in 1979 before resurging. The extent of cannabis use among women remains low compared with men, but the gap between use of cannabis by men and by women is narrowing (see the chapter *Global use of cannabis*).

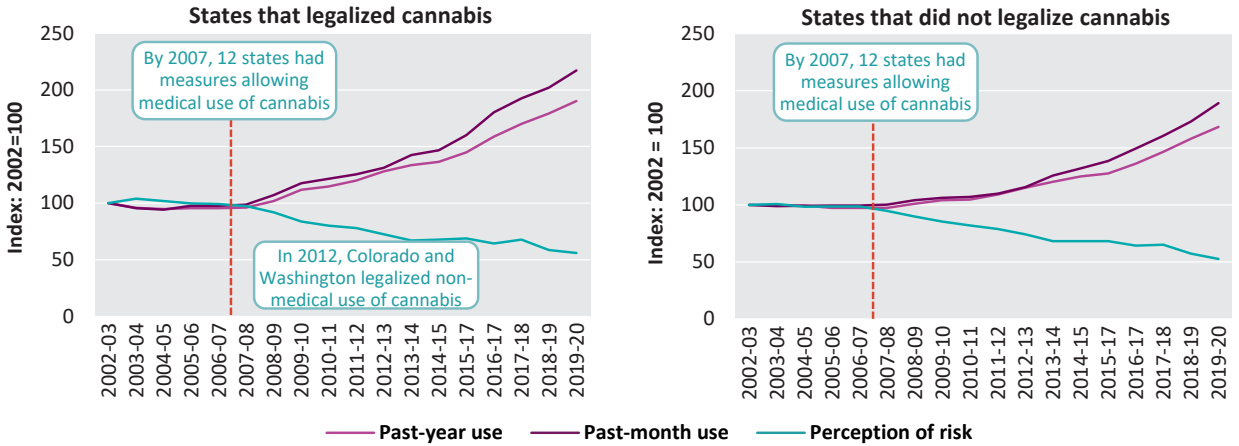
The trend in the last two decades was more marked (with higher rates of increase) in the jurisdictions that legalized non-medical use of cannabis than in those jurisdictions that did not.[65] Legalization by itself does

FIG. 17 Long-term trends in past-month cannabis use in the United States, by age group, 1971–2020



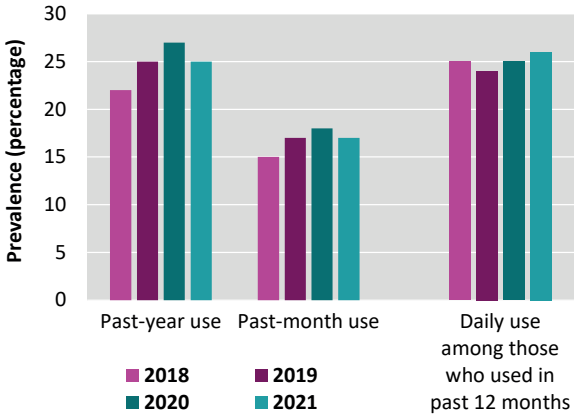
Source: "Results from the National Survey on Drug Use and Health: Detailed Tables" (Rockville, Maryland: Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality, 2020).

FIG. 18 Trends in cannabis use and perception of risk of harm among the population aged 18 and older, United States, 2002–2020



Source: "Results from the National Survey on Drug Use and Health: Detailed Tables" (Rockville, Maryland: Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality, 2020).

FIG. 19 Cannabis use in the general population, Canada, 2018–2021



Source: 'Cannabis Use - Data Blog - Public Health Infobase', Health Canada, 2021.

not account for the larger increase in cannabis use in those states where cannabis was legalized. In states that have legalized non-medical use of cannabis, such as Colorado, cannabis use has traditionally been above the national average.[66, 67]

Predating the expansion of the market were measures introduced in the early adopter states that allowed medical use of cannabis products and herb. The opening of retail outlets, brick-and-mortar dispensaries that were loosely regulated and had expansive definitions of conditions that justified obtaining a medical recommendation to access medical cannabis, changed risk perceptions of cannabis; allowed easy access to cannabis products, including cannabis herb; introduced products such as edibles that carried less stigma of using cannabis (even for medical use); and contributed to an increase in cannabis use and cannabis use disorders, at least among the adult population.[68, 69, 70, 71, 72, m]

Cannabis use in Canada and Uruguay has also increased post legalization, though not at the same rate of increase or to the same level of use as in the United States. In Uruguay, cannabis use began to increase from much lower levels than in the other two countries.

m Frequent cannabis use was defined as using cannabis on ≥300 days in the past year.

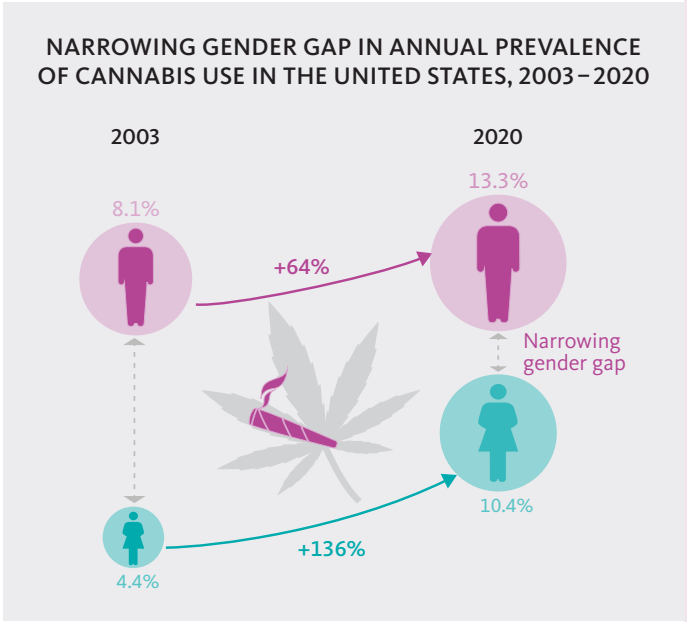
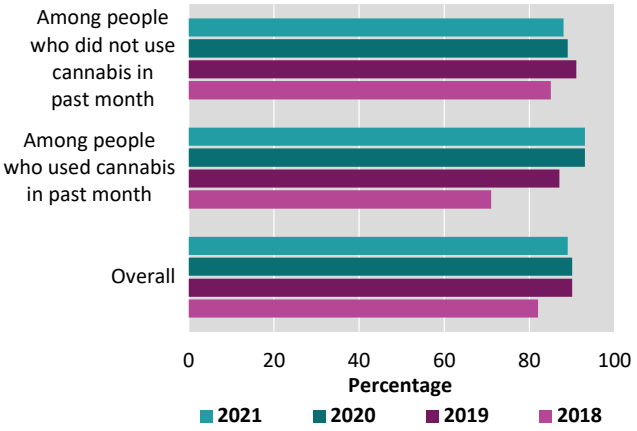


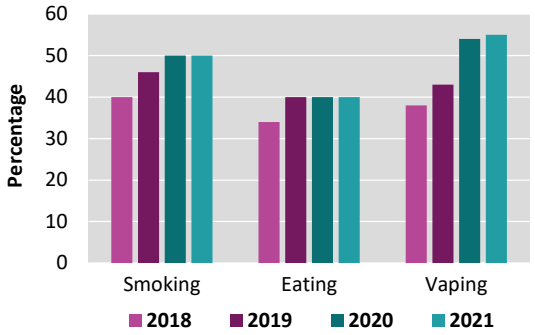
FIG. 20 Proportion of people in Canada who considered cannabis use to be "habit-forming" (addictive), 2018–2021



Source: "Cannabis Use - Data Blog - Public Health Infobase".

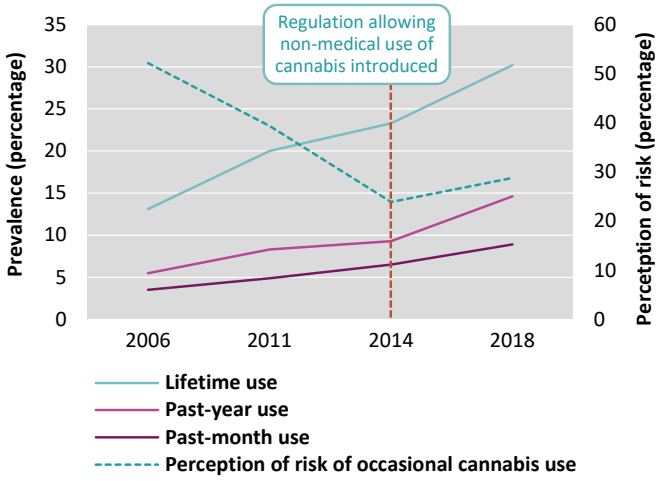
Unlike in the United States, in Canada, the perception that cannabis can be addictive has increased, especially among people who use cannabis regularly, reaching nearly 90 per cent of people in 2021.[73]

FIG. 21 Perception of risk from cannabis use among people who used cannabis in the past year, by method of consumption, Canada, 2018–2021



Source: "Cannabis Use - Data Blog - Public Health Infobase".

FIG. 22 Non-medical use of cannabis among the general population, Uruguay, 2001–2018



Source: "VII Encuesta Nacional Sobre Consumo De Drogas En Poblacion General" (Observatorio Uruguayo de Drogas, Junta Nacional de Drogas (JND) - Uruguay, 2019).

Changes in the extent of cannabis use among adolescents

Scientific literature indicates early initiation of substance use can be particularly harmful for the developing brain of adolescents.[74, 75, 76, 77]

Cannabis use among adolescents in state-level jurisdictions and in countries that have legalized cannabis in general seems to have remained stable following legalization,[78] although it remains much higher in these jurisdictions than in most countries that have not legalized non-medical cannabis.

In the United States, there have been a long-term trend of declining cannabis use among grade 10 students, accompanied by a decline in the risk perception of cannabis. However, in recent years, cannabis use, especially daily use, has increased.[79] Past-year use of cannabis by vaping more than doubled among high school students over the period 2017–2020, while past-month prevalence increased threefold.[n, 80, 81]

Pooled data of the Youth Risk Behavior Survey in the United States, from surveys conducted over the period 1997–2013 among students in grades 9 through 12, suggest that there was no association between cannabis use or frequency and measures allowing medical use of cannabis.[82] In Colorado, based on the Healthy Kids Colorado Survey and the Youth Risk Behavior Survey, past-month use of cannabis among high school students declined between 2005 and 2019.[o, 83]

In Canada, there has been no marked increase in cannabis use among school students.[84, 85] Cannabis use among school students aged 13–17 in Uruguay, however, seems to have increased between 2009 and 2018.

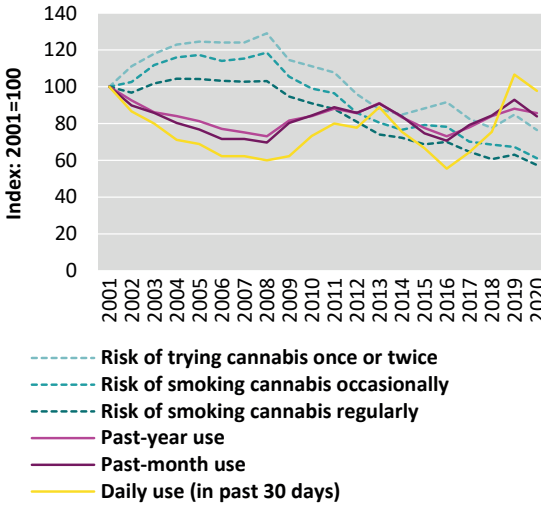
Changes in the extent of cannabis use among pregnant women

In general, the trend of an increase in cannabis use among the adult population is also reflected in increased cannabis use among women of reproductive age, including among women prior to, during and after pregnancy. Scientific literature has documented the potential adverse health effects of cannabis use during pregnancy on perinatal and child health outcomes.[86, 87, 88] It has been noted that the perception of harm of

n Past year prevalence increased from 6.8 to 16.3 per cent; past 30 days prevalence increased from 3.6 to 9.2 per cent; daily use of vaping cannabis though declined from 2.4 to 1.6 over 2019 and 2020.

o The decline was from 22.7 per cent in 2005 to 20.6 percent in 2019.

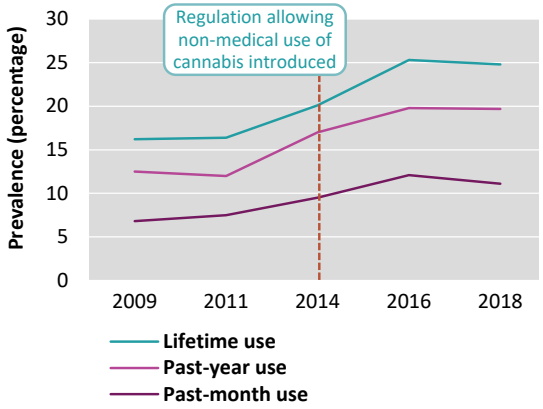
FIG. 23 Cannabis use and perception of risk among grade 10 students in the United States, 2001–2020



Source: Johnston et al., "Monitoring the Future: National Survey Results on Drug Use 1970 - 2020; Key Findings on Adolescent Drug Use.

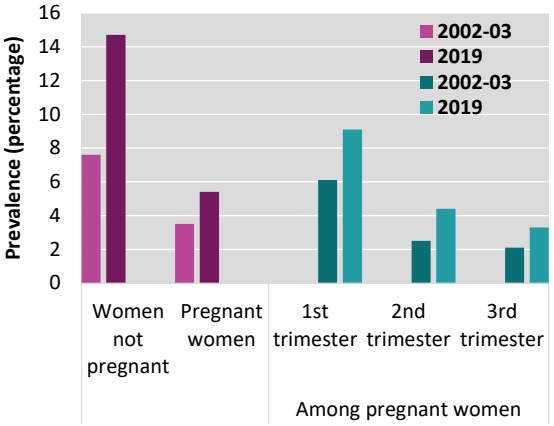
Note: The figure represents the trend in the number of students who perceived trying cannabis once or twice, occasionally or regularly as a risky behaviour.

FIG. 24 Trend in cannabis use among secondary school students aged 13–17, Uruguay, 2009–2018



Source: 'VIII Encuesta Nacional Sobre Consumo De Drogas En Estudianted de Ensenanza Media' (Observatorio Uruguayo de Drogas, Presidente Junta Nacional de Drogas, 2020)

FIG. 25 United States: past-month cannabis use among women aged 15-44, and during pregnancy, 2002-03 and 2019



Sources: United States, Substance Abuse and Mental Health Services Administration, *Key Substance Use and Mental Health Indicators in the United States: Results from the 2020 National Survey on Drug Use and Health* (Rockville, MD: Center for Behavioral Health Statistics and Quality, 2021).; United States, Substance Abuse and Mental Health Services Administration, *Key Substance Use and Mental Health Indicators in the United States: Results from the 2020 National Survey on Drug Use and Health* (Rockville, MD: Center for Behavioral Health Statistics and Quality, 2021),

cannabis use among pregnant women may be decreasing in step with legalization, and in some states, cannabis outlets were able to "recommend" cannabis to pregnant women to alleviate pregnancy-related symptoms.[89, p]

In the United States, cannabis use among women of reproductive age (15–44 years) and among pregnant women has sharply increased, although less so among pregnant than among women who are not pregnant.[90]

Combined survey data from the period 2016–2018 of the Pregnancy Risk Assessment Monitoring System, collected from 36,391 women in the United States, showed[q, 91] that residing in a state with legalized

p The study by Dickson et al showed that nearly 70 per cent of Colorado cannabis dispensaries that were contacted recommended cannabis products to pregnant women to treat nausea in the first trimester.

q The final sample included 36,391 women living in 16 states in the United States (Alaska, Colorado, Hawaii, Kansas, Kentucky, Maine, Michigan, Missouri, Montana, North Dakota, New Hampshire, South Dakota, Vermont, Washington, Wisconsin and West

non-medical use of cannabis was significantly associated with a higher prevalence of any cannabis use prior to, during and after pregnancy.[r, 92] For example, in Colorado, cannabis use among women before and during pregnancy and post-partum has increased considerably since legalization.

As more people use cannabis, the likelihood of their suffering medical and health consequences also increases

A "simultaneous quadruple confluence" of increasing prevalence of use, increasing intensity of use (in terms of both frequency and quantities), increasing THC content of cannabis products, and increasing hospitalization due to cannabis use and cannabis use disorders all likely interact multiplicatively in the context of studying the impact of legalization.[93]

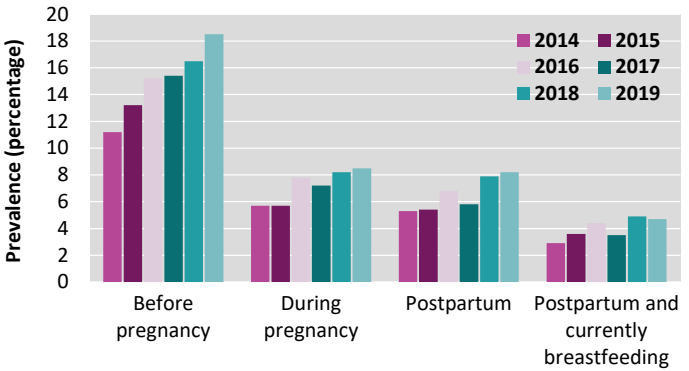
In the United States, cannabis exposure cases from 2010 to 2017 increased following legalization of non-medical use of cannabis in the state-level jurisdictions.[94]

In Colorado, cannabis-related emergency room visits and hospitalizations (including treatment of cannabis use disorders and dependence) increased considerably since 2013 but have shown a general stabilization since 2018. In emergency room visits, patients may present anxiety, panic attacks, public intoxication, vomiting and other, non-specific symptoms that could be precipitated by the use of cannabis products with varying THC content. This is especially the case with high-THC edible cannabis products, which take longer to reach peak psychoactive effects, which a person is unable to regulate.[95, 96]

Following the same trend as in Colorado, in California, after the opening of the retail sales market, emergency room visits and admissions for primary cannabis increased by 56 per cent from 2016 to 2019.[97, 98]

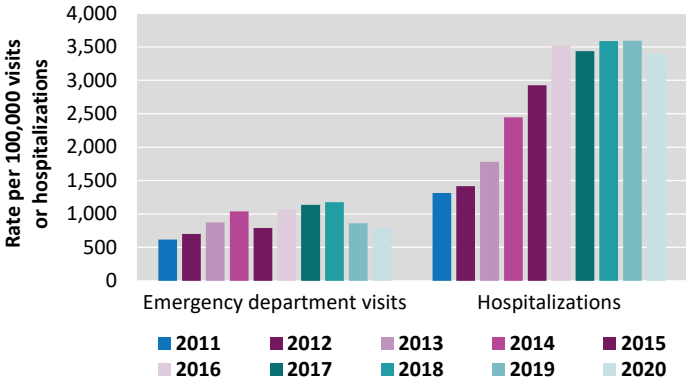
In Canada, from 2015 to 2018, there was an increase of 30 per cent in the annual percentage change in cannabis-related cases reported by the Canadian Hospitals Injury Reporting and Prevention Program.[99]

FIG. 26 **Colorado: cannabis use among women before and during pregnancy and in the post-partum and breastfeeding stages, United States, 2014–2019**



Source: Colorado Department of Public Health and Environment, "Pregnancy Risk Assessment Monitoring System (PRAMS)", data 2014–2019.

FIG. 27 **Colorado: cannabis-related emergency department visits and hospitalizations, United States, 2011–2020**



Source: Colorado Department of Public Health and Environment, "Colorado Hospital Association data".

Notes: COVID-19 pandemic may have affected rates due to changes in health-care utilization. Caution is therefore required when using the rates given for 2020 for comparisons. The Colorado Department of Public Health and Environment has three definitions of cannabis-related hospitalization and emergency department visits that include at least one cannabis-related billing code in up to 30 billing codes listed for each visit.

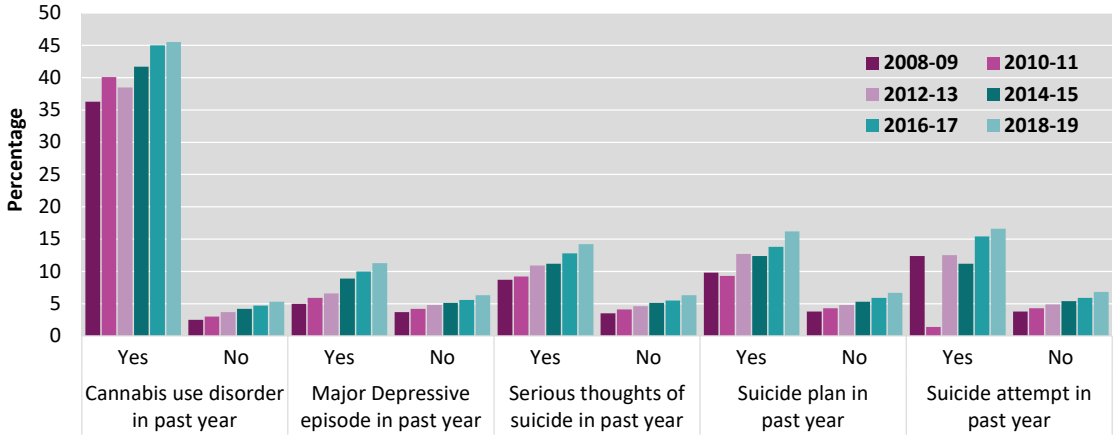
Cannabis use and frequency of cannabis use are associated with depression and suicide

Research shows that depression is associated with cannabis use and frequency of cannabis use.[100] Suicide

Virginia) who were asked questions specific to cannabis use in the Pregnancy Risk Assessment Monitoring System survey and who gave birth between 1 January 2016 and 31 December 2018, for a weighted sample reflecting 15,486,000 women.

r Cannabis use among pregnant women was significantly associated with being younger (18–29 years; 66 per cent) and unmarried (68.6 per cent); and low educational achievement (12 years or less; 55.6 per cent).

FIG. 28 **Trends in prevalence of daily or near daily use of cannabis among young people according to whether they reported cannabis use disorders, major depressive episodes, suicide ideation, plans and attempts in the last year, United States, from 2008-09 to 2018-19**



Source: Han et al., "Associations of Suicidality Trends with Cannabis Use as a Function of Sex and Depression Status".

rates in the United States increased between 2002 and 2018, particularly among people aged 18–34,[s, 101] and rates remains higher in states that have legalized cannabis than in states that have not.[102] In Colorado, the proportion of suicides in which cannabis was present, for which toxicology data were available, increased more than threefold between 2006 and 2018. In contrast, the proportion of suicides in which alcohol was present increased only slightly, from 35 per cent to 40.6 per cent over the same period.[103]

Overall, in the United States, past-year cannabis use disorder, daily cannabis and non-daily cannabis use were associated with a higher prevalence of past-year suicidal ideation, plans and attempts among young adults aged 18–23 of both sexes, with significantly higher prevalence among women than men.[104]

A study in a Canadian hospital emergency unit setting[t] observed that in the post-legalization period (2018), there was a significant increase in the use of cannabis (from 28 per cent to 37 per cent) among patients seeking consultations with a psychiatrist , especially among patients aged 18–24.[105] However, there was no statistically significant difference in terms of psychotic disorder diagnoses before or after legalization, but there was an increase in the proportion of those diagnosed with a personality disorder in the post-legalization period (increase from 39.6 per cent to 44.9 per cent).

As cannabis use and harmful patterns have increased in the United States, the association between cannabis use and depression also increased significantly between 2005 and 2016. A national survey[u] shows that individuals with depression have higher odds of any past-month cannabis use[v] and daily or near-daily use of cannabis[w] compared with those without depression.[106, 107]

s From the period 2008–2010 to the period 2017–2019, suicidal ideation increased by 64 per cent, plans of suicide 80 per cent and suicide attempts by 50 per cent and daily cannabis use increased by 84 per cent.

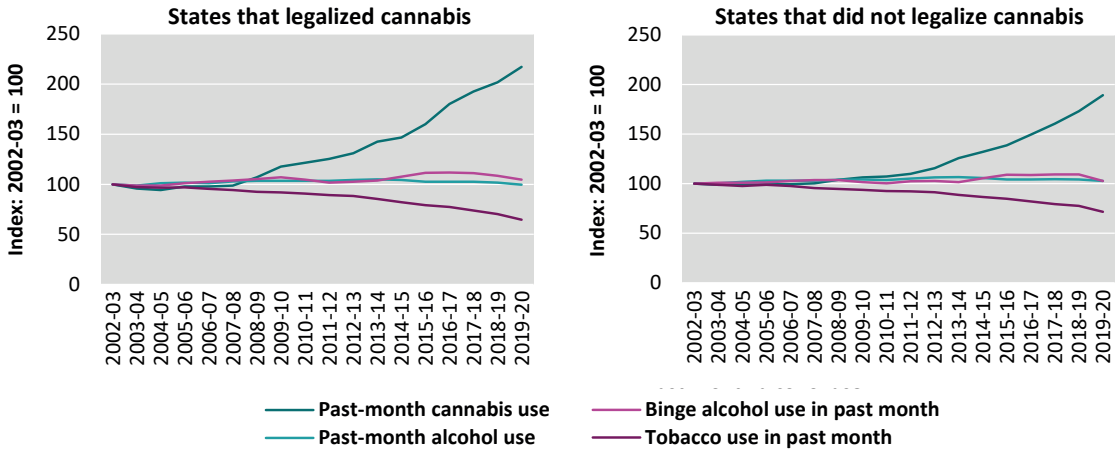
t The study reviewed psychiatric consultations among 1,247 patients who were 18 years or older two years prior to the study (pre-legalization) and 1,368 patients in the post-legalization period (five months after legalization of cannabis).

u National Health and Nutrition Examination Survey (NHANES) is a cross-sectional cohort study that used data from 16,216 adults aged 20 to 59 years in the United States.

v Odd Ratio 1.90; 95%CI, 1.62-2.24.

w Odd Ratio 2.29 - 95% CI, 1.80-2.92.

FIG. 29 Trends in past-month use of cannabis, alcohol, binge drinking and tobacco among the population 18 years and older in the United States, from 2002/03 to 2019/20



Source: UNODC elaboration of the state-level data reported in the National Survey on Drug Use and Health in the United States, from 2002/03 to 2019/20.

Mixed evidence on the substitution and complementarity of cannabis with alcohol

There is mixed evidence as to whether cannabis is used as a substitute for or a complement of alcohol. Some studies based on literature reviews have found more evidence of alcohol used as a substitute than as a compliment.[108, 109] Nevertheless, there is a strong positive association between regular cannabis and alcohol use in the United States and Canada.[110]

Overall, alcohol use in the past year remained stable between 2008 and 2019 in Canada.[111] In the United States, past-month use of alcohol and binge drinking has remained stable or moderately increased, and tobacco use has declined considerably, while cannabis use has increased substantially.[x] Like cannabis use, past-month binge drinking was significantly higher in states that have legalized non-medical use of cannabis than in those states that have not.

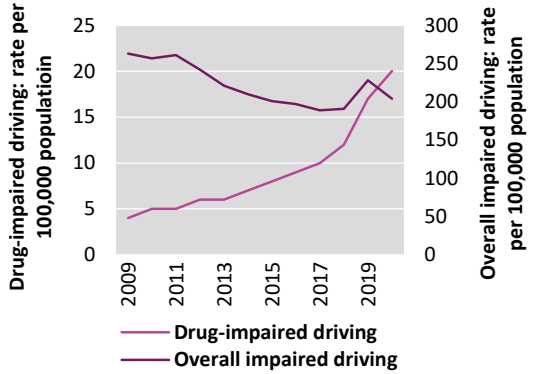
Data on per capita sales of alcohol in Colorado, Oregon and Washington show that since legalization of cannabis, there has been an increase by 1.7 per cent in per capita alcohol sales in Colorado and a slight decline in Oregon and Washington, implying that there was no evidence that legalization had had a significant impact on the sale of alcohol in those states.[112, 113] Consistent with national trends, per capita sales of beer declined in these States while per capita sales of spirits increased.[y]

Another study analysing United States data from the National Survey on Drug Use and Health showed that overall, any alcohol use in the lifetime, daily alcohol use and average drinks per day declined from 2002 to 2018 among adolescents and adults aged 12–25, and this decline was more rapid among those who used cannabis (on a daily and non-daily basis) than those who did not.[114]

x For the UNODC analysis states that had legalized cannabis included: Alaska, Arizona, California, Colorado, District of Columbia, Illinois, Maine, Massachusetts, Michigan, Montana, Nevada, New Jersey, New Mexico, New York, Oregon, South Dakota, Vermont, Virginia and Washington.

y The per capita sales of beer declined by 3.6 per cent in Colorado, 2.3 per cent in Washington and 3.6 per cent in Oregon. The per capital sale of spirits increased by 3.6 per cent in Colorado, 2.3 per cent in Washington and 3.6 per cent in Oregon in 2018.

FIG. 30 Overall impaired driving (alcohol- and drug-related) and drug-impaired driving, Canada, 2009–2020



Source: Statistics Canada, Government of Canada, 'Police-reported crime statistics in Canada, 2020', 27 July 2021.

Note: Includes overall alcohol- and/or drug-impaired operation of a vehicle, alcohol- and/or drug-impaired operation of a vehicle causing death or bodily harm, failure or refusal to comply with testing for the presence of alcohol or drugs and failure or refusal to provide a breath or blood sample.

Public safety

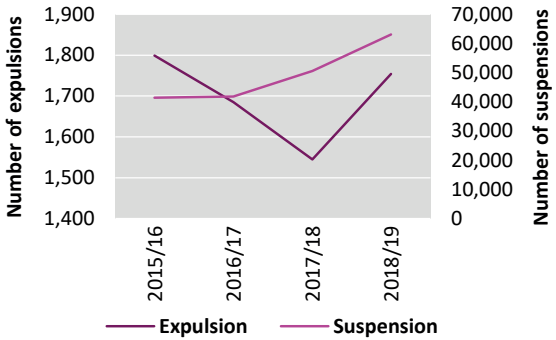
Evidence on the increase in driving under the influence and traffic fatalities attributed to cannabis remains inconclusive

Studies of the effects of the legalization of non-medical use of cannabis on traffic accidents have produced mixed findings, and there is little difference in cannabis- or alcohol-related traffic fatalities between the states that have and those that have not legalized non-medical use of cannabis in the United States.[115, 116]

The number of fatalities in which the driver tested positive for cannabinoids as the only substance present increased in Colorado from 23 fatalities in 2013 to 42 in 2019.[117] However, while individual states such as Colorado may show an increase in traffic fatalities involving cannabis use, it has been argued that this upward trend would have taken place whether or not non-medical use of cannabis had been legalized.[118]

In Colorado, citations for driving under the influence of cannabis use increased by 17 per cent between 2014 and 2017, but the number of citations that involved cannabis and other drugs doubled, and those that involved cannabis and alcohol increased fourfold.[119]

FIG. 31 California public school drug-related expulsions and suspensions, from 2015/16 to 2018/19



Source: Based on the data presented in "Marijuana Impact on California, 2020".

The proportion of adults who reported driving within 2–3 hours of using cannabis in Colorado increased from around 2.5 per cent in 2008 to 3.8 per cent in 2018 and has remained stable since then.[120] The proportion of people in treatment for driving under the influence who had cannabis as their primary drug also increased threefold in that same time-span.

In Canada, among people who had used cannabis in the past 12 months, 21 per cent reported in 2021 that they had driven at least once within two hours of smoking or vaporizing cannabis, a percentage unchanged from 2020.[121] The overall rates of people charged with drug-impaired driving increased fivefold between 2009 and 2020. It is possible that at least part of this increase was due to better detection rather than an actual rise in drug-impaired driving.[122]

School discipline: cannabis-related infractions remain the main infringements leading to expulsion and suspension

While cannabis use remains stable, although at high levels, among high school students, data from two states where cannabis has been legalized, California and Colorado, suggest that cannabis-related infractions in school remain the main infringements for which high school students are expelled or suspended and/or referred to law enforcement authorities.[z, 123]

z In Colorado, Senate Bill 12-046 and House Bill 12-1345 have

FIG. 32 Number of suspensions and expulsions due to cannabis violations in Colorado public schools, 2015–2020

Source: Based on the school suspension data of Colorado Department of Education,

Criminal justice

Arrests for possession of cannabis use among adults had declined considerably

Over the years, in the United States, including in the states that have legalized non-medical use of cannabis, there has been a substantial decline in both the absolute number and rates of people arrested for possession of cannabis for personal use. These trends started long before states began to allow medical or non-medical use of cannabis.

Nevertheless, in the state-level jurisdictions that legalized non-medical use of cannabis, arrests for cannabis possession declined significantly for adults but not for minors. Legalization of cannabis is explicitly for adults, and, in most cases, youth possession remains a criminal offence. Thus, it is possible that legalization for adults has led to a focus of police attention on enforcing the law for youths.

There is a clear disparity in how adults and youths go through the criminal justice system for possession of cannabis in states that have legalized non-medical use of cannabis. A study comparing seven states with a policy of cannabis decriminalization and four states that had legalized non-medical use of cannabis for adults[124] showed that the adult arrest rate for cannabis possession decreased after the implementation of decriminalization in the former group of states and after the implementation of legalization in the latter group of states, but that the decline in youth arrested for cannabis possession for use was not significant in the states that had legalized cannabis.[125]

In Colorado, rates of arrest for possession of cannabis among juveniles (aged 10–17) decreased by 42 per cent, but the share of youth increased. In 2019, juveniles accounted for 48 per cent of all cannabis arrests compared to 25 per cent in 2012.[126] Over the same period, the overall rates of arrest for possession of cannabis declined by 71 per cent. This decline is visible for all races, although racial disparities in the rates of arrest have widened.

In states with legalization, other cannabis-related crimes or offences have emerged, including cultivation

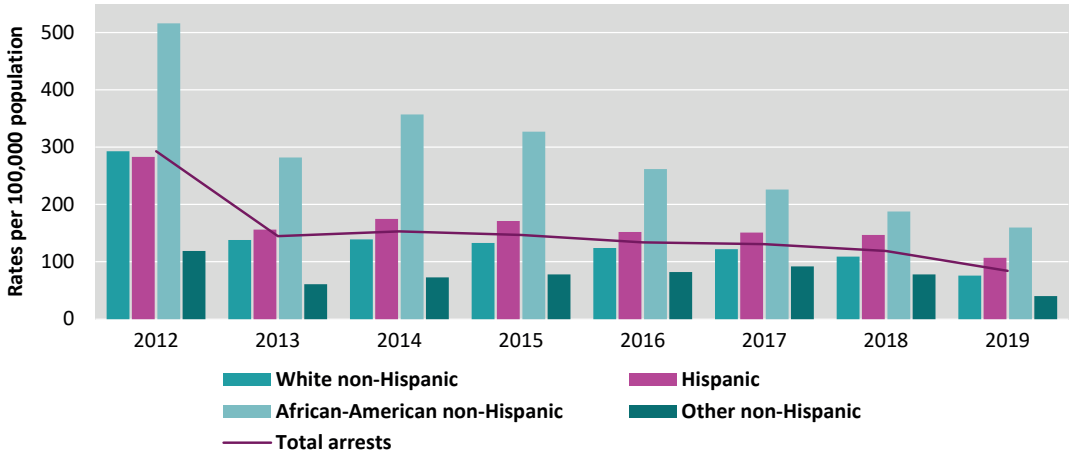
TABLE 2 Changes in rates of arrest per 100,000 population in states that had decriminalized cannabis possession and use and those that had legalized cannabis, 2000–2016

Population	States with decriminalization (Rates per 100,000 (95% Confidence Interval))	States with legalization (Rates per 100,000 (95% Confidence Interval))
Youths (<18 y)	−59.16 (−75.91 to −42.41)	−7.48 (−30.46 to 15.49)
Adults (≥18 y)	−131.28 (−154.21 to −106.23)	−168.50 (−229.65 to −158.64)

Source: Andrew D. Plunk et al., 'Youth and Adult Arrests for Cannabis Possession After Decriminalization and Legalization of Cannabis', *JAMA Pediatrics* 173, no. 8 (1 August 2019): 763.

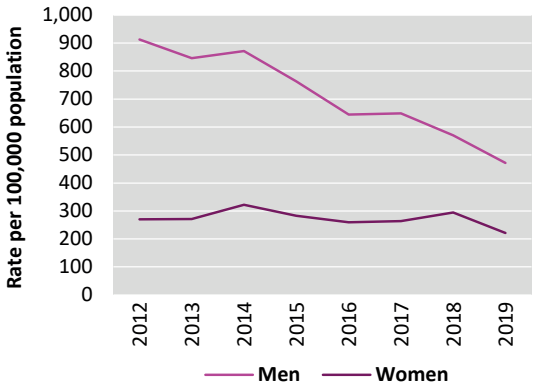
targeted the reform of "zero-tolerance" policies in schools, and this may have resulted in the recent reduction in the number of expulsions, suspensions, and referrals to law enforcement.

FIG. 33 Arrests for cannabis possession by race in Colorado, 2012–2019



Source: Jack K Reed, 'Impact of Marijuana Legalization in Colorado' (Colorado Division of Criminal Justice, July 2021).

FIG. 34 Cannabis arrests rates of juveniles (12-17 years) in Colorado, 2012–2019



Source: Colorado Bureau of Investigation, National Incident-Based Reporting System; Colorado State Demography Office.

of cannabis on public land; cannabis trade between states; the diversion of cannabis products out of state; and clandestine THC extraction (laboratories).[127]

Regarding the trend of criminal justice system expenditures, most of the states that have legalized cannabis show no clear increase or decrease in expenditures relative to national trends.[128]

Changes in violent and property crimes are not associated with cannabis legalization

Looking at the impact of cannabis legalization on crime,[aa] in 2019 there was no difference per se in the rates of violent and property crimes, reported by the authorities within the states in the United States that had legalized non-medical use of cannabis and those that had not. Between 2010 and 2019, the rates of most violent crimes (except rape) declined across the entire United States, although the decline in states that had legalized cannabis was much less pronounced than in the rest of the United States.[129]

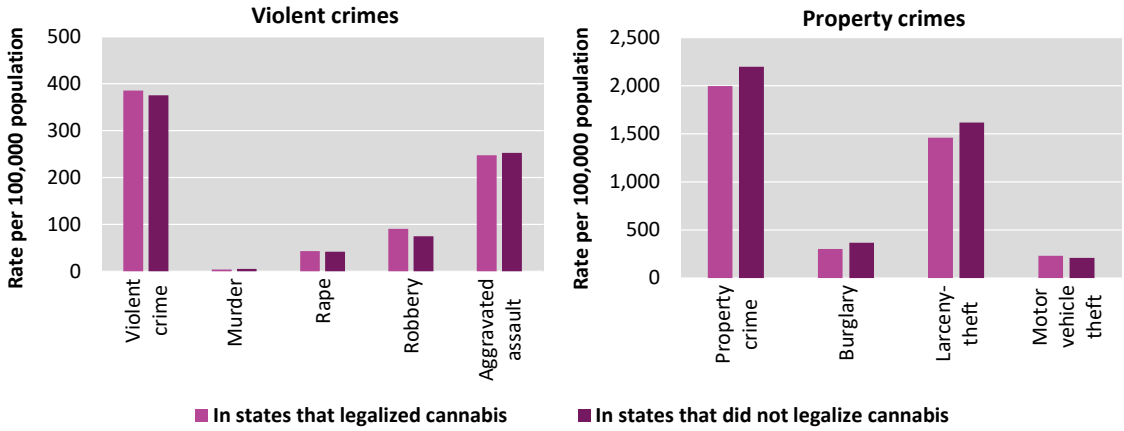
The different levels and trends in the rates of violent and property crimes across jurisdictions cannot be attributed to the legalization (or not) of cannabis.[130]

In Canada, overall, crime rates were on the increase until 2019 since 2014, but declined in 2020, although this change may be attributable to the pandemic.[131]

The vulnerability of the cannabis trade, as a cash-based business, could also have created incentives for crimes

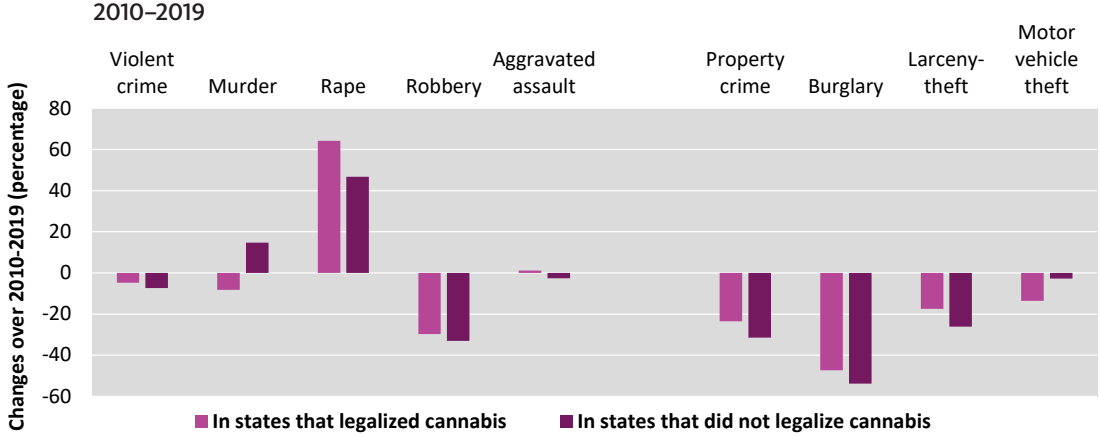
aa For the UNODC analysis, states that had legalized cannabis included Alaska, Arizona, California, Colorado, District of Columbia, Illinois, Maine, Massachusetts, Michigan, Montana, Nevada, New Jersey, New Mexico, New York, Oregon, South Dakota, Vermont, Virginia and Washington.

FIG. 35 Rates of volent crimes and property crimes reported by the authorities in the United States, 2019



Source: UNODC elaboration based on 'Crime in the United States' (United States Department of Justice, Federal Bureau of Investigation, Criminal Justice Information Services Division, 2019).

FIG. 36 Changes in rates of violent and property crimes reported by the authorities in the United States, 2010–2019

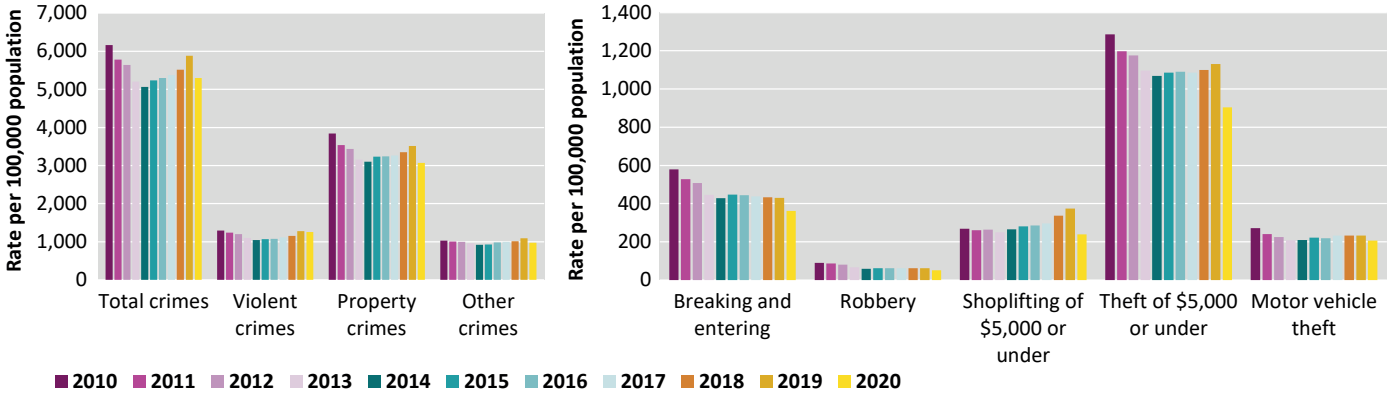


Source: UNODC elaboration of the date from 'Crime in the United States' (United States Department of Justice, Federal Bureau of Investigation, Criminal Justice Information Services Division, 2019).

such as burglary, shoplifting and robbery. A study based on data from three major cities in the State of Washington showed that the cannabis trade had had no significant effect on overall crime in any particular neighbourhood type, but found strong evidence of an increase in property crimes concentrated around cannabis dispensaries in low-income neighbourhoods.[132]

In a study conducted in Denver, Colorado, it was found that, except for murder and auto theft, cannabis dispensaries were associated with statistically significant increases in rates of neighbourhood crime and disorder.[133] The study concluded that burglaries and robberies inside and around dispensaries may relate to cannabis as it was a desirable product and was a cash-only industry.[134]

FIG. 37 Trends in overall, violent and property crimes reported by the authorities in Canada, 2010–2020



Source: Statistics Canada, Canadian Centre for Justice and Community Safety Statistics, Uniform Crime Reporting Survey.

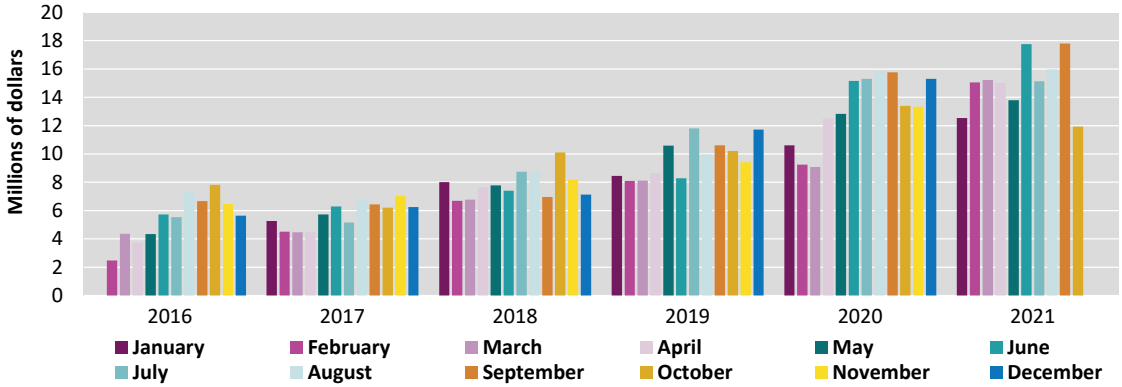
Cannabis market developments

Revenues and taxes from cannabis have increased

The legalization of cannabis and the for-profit production of a range of cannabis products have generated revenues for corporations investing in the business and the jurisdictions that have legalized cannabis.

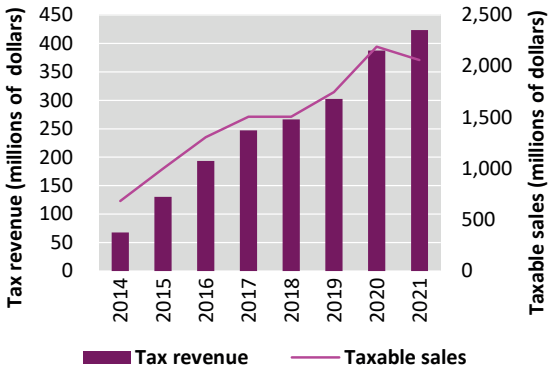
In 2020, the cannabis market in California reached $4.4 billion in sales, rising from $1.4 billion in 2018. In Colorado, the cannabis market increased to over $2 billion, from $1 billion in 2015, while in Washington it peaked at $1.4 billion, and in Oregon it exceeded $1 billion in 2020.[135] All state-level jurisdictions that have legalized cannabis impose significant excise taxes on non-medical cannabis sales, along with standard state sales taxes, other local taxes and licensing fees. In 2020, Colorado generated $387 million in state sales taxes from sales of cannabis, California's tax revenue was $1.1. billion and Washington's sales tax revenue from cannabis in 2020 was $91.8 million. These amounts are considered to have exceeded earlier forecasts, although revenue growth was sluggish

FIG. 38 Oregon monthly state tax revenues from cannabis sales, 2016–2021



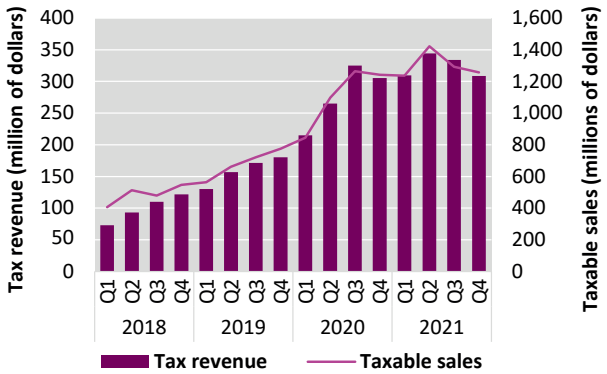
Source: Department of Revenue, Oregon.

FIG. 39 Colorado annual cannabis sales and tax revenue, 2014–2021



Source: Office of Research and Analysis, Colorado Department of Revenue.

FIG. 40 California quarterly cannabis tax and sales revenue, 2018–2021



Source: California Department of Tax and Fee Administration.

during initial sales periods in many states.[136] However, in relative terms, cannabis revenues make up a small percentage of the states' overall revenues.

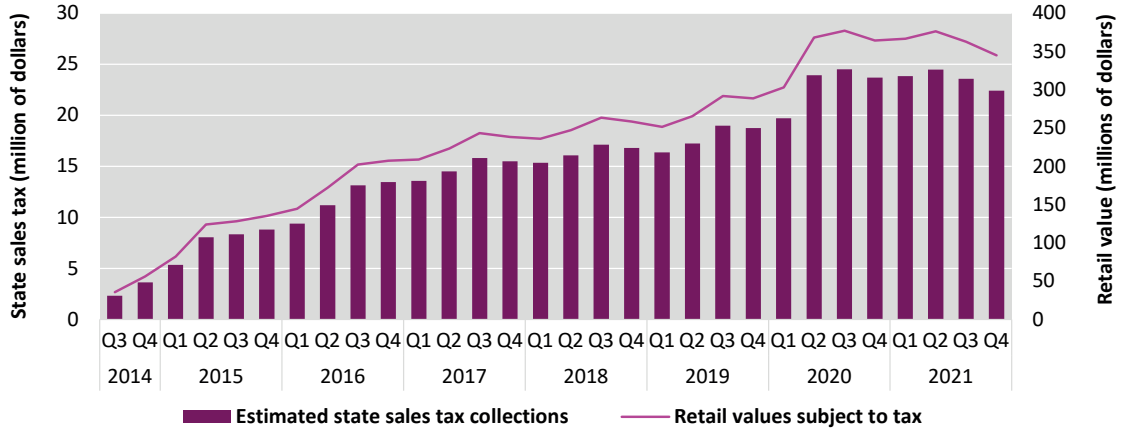
In many United States jurisdictions, prices of cannabis declined after legalization, before stabilizing, although prices in different markets vary and depend on THC content and the type of product.

In Canada, the retail value of the cannabis market in 2020 was 2.6 billion Canadian dollars, and 3.8 billion Canadian dollars in 2021.

The illegal cannabis market continues to exist alongside legal markets in jurisdictions that have legalized cannabis

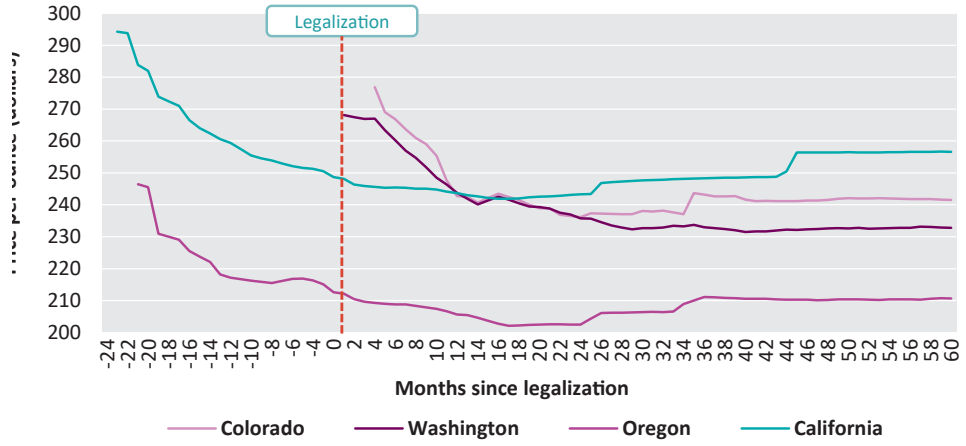
While the cannabis markets are developing and gaining an increasing share of the market through "legal" sources in jurisdictions where cannabis has been legalized, the illegal market also continues to exist. In 2021, nearly half of Canadians obtained their cannabis for non-medical use from an unlicensed or illegal source,[137] and in the fourth quarter of 2021 nearly 40 per cent of household expenditure on cannabis products was

FIG. 41 State of Washington quarterly cannabis tax and sales revenue, 2014-2021



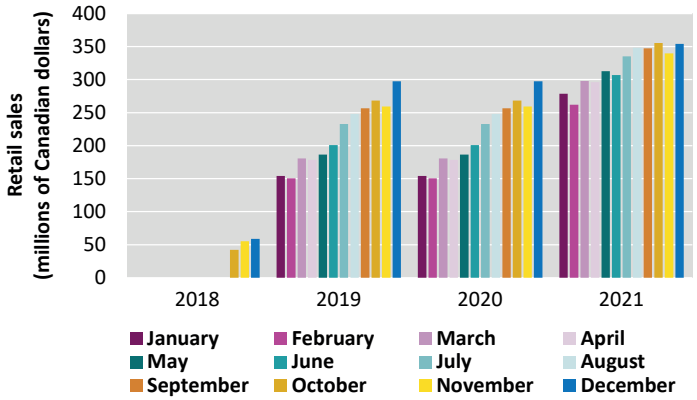
Source: Department of Revenue, State of Washington.

FIG. 42 Monthly cannabis prices in four states that legalized cannabis in the United States



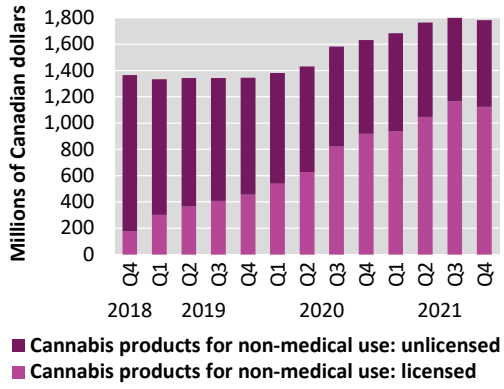
Source: Based on the figure presented in Dills et al., "The Effect of State Marijuana Legalizations: 2021 Update".

FIG. 43 Monthly cannabis retail sale, Canada, October 2018–December 2021



Source: Statistics Canada, table 20-10-0008-01 (Retail trade sales by province and territory).

FIG. 44 Household expenditure on cannabis products for non-medical use, Canada, 2018–2021



Source: Statistics Canada, table 36-10-0124-01 (Detailed household final consumption expenditure), Canada, quarterly.

from unlicensed sources. In Uruguay, by February 2022, around 69,000 people of the 158,000 past-month users (estimated in 2018) were accessing cannabis through the legal cannabis market. Thus, the legal market provided cannabis for less than half of regular cannabis users.[138]

In 2019, the illegal cannabis market was considered to account for about three quarters of cannabis sales in California.[139] In other states such as Washington, Colorado and Oregon, among others, where there is no estimate of the size or extent of the illegal market, such markets seem to have continued to operate alongside the legal/regulated cannabis markets.[140]

Illegal or black markets continue to exist owing, among other reasons, to price disparities between legal and illegal sources due to taxation, the fact that some jurisdictions within states opt out of cannabis legalization measures and because of individuals or groups

cultivating unlicensed cannabis on public property or organized crime groups trafficking cannabis out of state.[141, 142, 143, 144]

Big corporations including from the alcohol and tobacco industries are investing in the cannabis industry

The size of the overall legal cannabis market in the United States is estimated at $30 billion.[145] As further growth potential is projected, there is a growing influence of and investment by large corporations, including the alcohol and tobacco industries, which are investing in the cannabis industry in North America.[146] There are concerns, for instance, that the practice of capping licences for cannabis production in some jurisdictions tends to favour those who have been lobbying to create monopolies, while in other places, large corporations investing in the cannabis business are taking a larger market share. Through market dominance, large corporations can influence regulatory frameworks to their own benefit and exclude small businesses and artisanal cannabis production.[147, 148]

Cannabis products with high potency have proliferated

In the state-level jurisdictions that have legalized cannabis in the United States and Canada, there has also been a diversification of cannabis products, methods of use and changes in the potency of the THC contents of the available products. The potency of seized cannabis flower (the THC content) in the United States has more than doubled since 2000, to around 14 per cent in 2019, but there are products with levels of THC contents of 20 per cent or higher in some jurisdictions that legalized the drug and, in particular, concentrates with much higher potency.[149, 150, 151, 152, 153]

In Colorado, for instance, while cannabis flower remains the main product sold, there is an increasing share of other cannabis products.[154]

TABLE 3 Average THC content per gram of cannabis products sold in Colorado, 2020

Product	Average THC (percentage) by weight
Flower	19.17
Shake/Trim	17.03
Concentrates	67.82
500 mg cartridge (each)	79.67
Oil	73.6
Resin	71.6
Shatter	70.97
Sugar	70.93
Wax	70.93
Butter	67.14
Hash	61.4

Source: '2020 Regulated Marijuana Market Update' (Colorado Department of Revenue, Marijuana Enforcement Division).

Note: Average THC content (percentage) by weight means that if 1 g of cannabis contains 10 per cent of THC, that 1 g contains about 100 mg of THC.

TABLE 4 Quantities sold for different cannabis products in Colorado, 2020

Products	Quantity	Percentage of sales
Flowers	263.9 tons	63
Shake/trim	35.5 tons	7.5
Concentrates	21.2 tons	21.2
Concentrates	11.5 million units	5.1
Infused edibles	14.8 million units	3.0
Infused products	762,858 units	0.2

Source: '2020 Regulated Marijuana Market Update' (Colorado Department of Revenue, Marijuana Enforcement Division.

Regulations for the legalization of the non-medical use of cannabis in Canada, the United States and Uruguay

TABLE 5 **Regulations for the legalization of the non-medical use of cannabis in Canada**

	Federal law	Alberta	British Columbia	Manitoba
Legal process	Government legislation			
Title	Cannabis Act and Cannabis Regulations	Gaming, Liquor and Cannabis Act and Gaming, Liquor and Cannabis regulation	Cannabis control and licensing Act (CCLA) Cannabis distribution Act (CDA)	Safe and Responsible Retailing of Cannabis Act
Date implemented	17-Oct-18			
Regulatory authority	Health Canada	Alberta Gaming Liquor and Cannabis (AGLC)	Liquor and cannabis regulation branch	Liquor, Gaming and Cannabis Authority of Manitoba (LGCA) Manitoba Liquor and Lotteries (MBLL)
Minimum age	18	19	19	19
Personal public possession limit	30 g dried or equivalent i.e., 150 g of fresh cannabis 450 g of edible product 2,100 g of liquid product 7.5 g of concentrates (solid or liquid) 30 cannabis plant seeds 4 cannabis plants not budding or flowering	30 g or equivalent legal cannabis product	30 g or equivalent legal cannabis product	30 g or equivalent legal cannabis product
Home cultivation	Grow 4 cannabis plants per residence for personal use. Prepare cannabis products such as food and drink at home if organic solvents are not used.	Maximum 4 plants per household	Maximum 4 plants per household	Home cultivation not permitted
Interpersonal sharing	30 g or equivalent of legal cannabis product between adults			
Retail transaction limit		30 g dried cannabis or equivalent	30 g dried cannabis or equivalent	30 g dried cannabis or equivalent
Maximum THC content	Dried cannabis/fresh cannabis: No THC or THCA can be added to dried or fresh cannabis products. Edible cannabis: 10 mg of THC per package. Cannabis extract (for ingestion or nasal, rectal or vaginal use): 10 mg of THC per unit (such as a capsule) or dispensed amount, 1000 mg of THC per package. Cannabis topical (for applying externally): 1000 mg of THC per package.		Edibles may contain up to a total of 10 mg per package, inhalable extracts (vapes/concentrates) and ingestible extracts (oils) may contain up to 1 g of THC per package, with a maximum of 10 mg of THC per unit in the case of capsules.	
Commercial production	Federal processing licence is required in order to produce cannabis products and to package and label these products for sale to consumers via medical sales licence holders or provincial/territorial authorized distributors and retailers. Each province has an Excise stamp that needs to be fixed on the cannabis products.			
Commercial distribution	Distribution is the responsibility of provincial and territorial governments	Distribution: public In-person retail: private Online retail: private	Distribution: public In-person retail: hybrid Online retail: public	Distribution: public In-person retail: private Online retail: private

	Federal law	Alberta	British Columbia	Manitoba
Restrictions on edibles	• Edible cannabis, extracts and topicals became legal for sale October 2019. • Edible cannabis products must be shelf-stable and can only contain food and food additives as ingredients. If any components have a pH> 4.6 and water activity> 0.85, they must not be packaged in hermetically sealed containers. • Edible cannabis must not contain meat, poultry or fish products as ingredients unless they are dried products produced in accordance with the Safe Food for Canadians Act or applicable provincial or territorial law and have a water activity equal to or less than 0.85 at room temperature. • Edible cannabis products must not contain any food described in a Temporary Marketing Authorization Letter under the FDR, vitamin or mineral fortification, poisonous or harmful substances, or anything considered unsafe that would cause the sale of a food to be prohibited under the Food and Drugs Act. • Caffeine, ethyl alcohol and nicotine are prohibited additives except for ingredients with naturally occurring caffeine (such as chocolate, tea or coffee) provided the total amount of caffeine per package does not exceed 30 mg, and ethyl alcohol that does not exceed 0.5% w/w (e.g. that might be present as a by-product in certain ingredients).			
Promotion, Packaging, and Labelling	No promotion, packaging or labelling that could be considered appealing to young people, and ensuring that important product information is presented clearly. Labelling of edible products need to have a standardized cannabis symbol for products containing THC; Health warning message; THC/CBD content; Equivalency to dried cannabis to determine public possession limit; Ingredient list, allergens; nutrition facts table, intended use.	No promotion, packaging or labelling that could be considered appealing to young people, and ensuring that important product information is presented clearly. Advertising allowed inside cannabis stores.	Same as Federal Law	
Taxation Cannabis excise duty rates in provinces and territories (Department of Finance, Canada)	Flower $0.25/g Trim $0.75/g Seed $0.25/seed Seedling $0.25/seedling Federal Ad Valorem Rate 2.5% of dutiable amount of cannabis product when delivered to purchaser	Flower: $ 0.75/g plus 16.8% of base amount Trim: $0.225/g plus 17.8% of base amount Seed: $0.75/seed plus 16.8% of base amount **Ad Valorem Additional Rate 7.5% plus 16.8% of deductible amount when delivered (total applicable rate 24.3%)**	Flower $0.75/g Trim $0.22/g Seed and seedling: $0.75/seed or seedling **7.5% provincial sale tax in addition to Federal taxes** 20% provincial sale tax to dried cannabis vaporizers and liquid marijuana vaping products	Wholesale mark-up on non-medical cannabis, a $0.75/g mark-up plus 9% per cent mark-up applied on top of the $0.75/g
Restrictions on use	Provinces and territories can tailor certain rules n their own jurisdictions, such as: • Licensing the distribution and retail sale in their respective jurisdictions and conducting associated compliance and enforcement activities; • Setting additional regulatory requirements to address areas of local concern, such as setting more restrictive requirements than federal provisions for minimum age limits, limits on possession or personal cultivation; • Establishing provincial zoning rules for cannabis-based businesses; • Restricting where cannabis may be consumed; and • Amending traffic safety laws to address driving while impaired by cannabis.	In cars, areas frequented by children, or tobacco-restricted areas.	In cars, areas frequented by children, or tobacco restricted areas.	Smoking and vaping cannabis is illegal in public places (including enclosed public places).

	New Brunswick	New Foundland and Labrador	Northwest Territories
Legal process			
Title	Cannabis Control Act Cannabis Management Corporation Act	Newfoundland and Labrador Cannabis Regulations Control and Sale of Cannabis Act	Cannabis Legalization and Regulation Implementation Act
Date implemented			
Regulatory authority	Cannabis NB	Newfoundland and Labrador Liquor Corporation (NLC)	North West Territories Liquor & Cannabis Commission (NTLCC)
Minimum age	19	19	19
Personal possession quantity	30 g or equivalent legal cannabis product	30 g or equivalent legal cannabis product	30 g or equivalent legal cannabis product
Home cultivation	30 g or equivalent legal cannabis product	30 g or equivalent legal cannabis product	30 g or equivalent legal cannabis product
Interpersonal sharing			
Retail transaction limit	30 g dried cannabis or equivalent	30 g dried cannabis or equivalent	
Maximum THC content			
Commercial production			
Commercial distribution	Distribution: public In-person retail: Hybrid Online retail: public	Distribution: public In-person retail: private Online retail: public	Distribution: public In-person retail: private Online retail: public
Restrictions on edibles			
Promotion, Packaging, and Labelling	Advertising and promotion of cannabis is prohibited except in very limited circum-stances (much like tobacco).		
Taxation **Cannabis excise duty rates in provinces and territories (Department of Finance, Canada)**	Flower: $0.75/g Trim:$0.225/g Seed/seedlings $0.75 **7.5% of the dutiable amount when delivered to purchaser**	Flower: $0.75/g Trim:$0.225/g Seed/seedlings $0.75 **7.5% of the dutiable amount when delivered to purchaser**	Flower: $0.75/g Trim:$0.225/g Seed/seedlings $0.75 **7.5% of the dutiable amount when delivered to purchaser**
Restrictions on use	Illegal to smoke everywhere except private property or residence	Illegal to smoke everywhere except private property or residence	Illegal to smoke everywhere except private property or residence

	Nova Scotia	Nunavut	Ontario
Legal process			
Title	Cannabis Control Act	Cannabis Act Cannabis Statutes Amendments Act	Cannabis, Smoke-Free Ontario, and Road Safety Statute Law Amendment Act, 2017 Cannabis Statute Law Amendment Act, 2018
Date implemented			
Regulatory authority	Nova Scotia Liquor Corporation	Nunavut Liquor and Cannabis Commission	Alcohol and Gaming Commission of Ontario
Minimum age	19	19	19
Personal possession quantity	30 g or equivalent legal cannabis product	30 g or equivalent legal cannabis product	30 g or equivalent legal cannabis product
Home cultivation	Maximum 4 plants per household	Maximum 4 plants per household	Maximum 4 plants per household
Interpersonal sharing			
Retail transaction limit		30 g dried cannabis or equavalent	30 g dried cannabis or equavalent
Maximum THC content			
Commercial production			
Commercial distribution	Distribution: public In-person retail: public Online retail: public	Distribution: public In-person retail: private Online retail: private	Distribution: public In-person retail: private Online retail: public
Restrictions on edibles	Sale of edibles illegal under Federal law. Edibles can be produced at home for personal use.		
Promotion, Packaging, and Labelling	The Cannabis Act has strict rules around the promotion of cannabis (similar to those for tobacco). It is prohibited to promote cannabis or a cannabis accessory or any service related to cannabis.	All cannabis products, online stores and accessories must comply with the Cannabis Act (Canada) and all applicable Nunavut and Federal legislation, regulations and by-laws pertaining to label standards, promotions, advertising, package sizes and case marking.	All cannabis products must comply with the Cannabis Act (Canada) pertaining to label standards, promotions, advertising, package sizes and case marking.
Taxation Cannabis excise duty rates in provinces and territories (Department of Finance, Canada)	Flower: $0.75/g Trim: $0.225/g Seed/seedlings $0.75 **7.5 % of the dutiable amount when delivered to purchaser**	Flower: $0.75/g plus 19.3% of base amount Trim: $0.225/g plus 19.3% of base amount Seed/seedling: $0.75 seed plus 19.3% of base amount **7.5% plus 19.3% of the dutiable amount of a cannabis product when delivered to a purchaser (total applicable rate of 26.8%)**	Flower: $0.75/g plus 3.9% of base amount Trim: $0.225/g plus 19.3% of base amount Seed/seedling: $0.75 seed plus 19.3% of base amount **7.5% plus 19.3 % of the dutiable amount of a cannabis product when delivered to a purchaser (total applicable rate of 26.8 %)**
Restrictions on use	Illegal everywhere except for areas where tobacco may be smoked.	Illegal everywhere except for areas where tobacco may be smoked.	Illegal to smoke everywhere except private property.

	Prince Edward Island	Quebec	Saskatchewan	Yukon
Legal process				
Title	Cannabis Control Act Cannabis Management Corporation Act	Cannabis Regulation Act Act to constitute the Société québécoise du cannabis (SQDC)	The cannabis control (Saskatchewan) Act The cannabis controlb(Saskatchewan) regulations	Cannabis control and regulation act
Date implemented				
Regulatory authority	Provincial cannabis committee Cannabis management corporation	Société québécoise du cannabis	Cannabis Authority under the Saskatchewan Liquor and Gaming Authority	Yukon Liquor Corporation Cannabis Licensing Board (2019)
Minimum age	19	21	19	19
Personal possession quantity	30 g or equivalent legal cannabis product	30 g or equivalent legal cannabis product	30 g or equivalent legal cannabis product	30 g or equivalent legal cannabis product
Home cultivation	Maximum 4 plants per household	Home cultivation not permitted	Maximum 4 plants per household	Maximum 4 plants per household
Interpersonal sharing				
Retail transaction limit		30 g dried cannabis or equavalent per visit at Société québécoise du cannabis	30 g dried cannabis or equavalent	30 g dried cannabis or equavalent
Maximum THC content		The THC concentration present in cannabis must not exceed 30% per weight. An edible cannabis product in solid form may not contain a quantity of THC greater than 10 mg per package and a maximum of 5 mg of THC is fixed per distinguishable portion unit. An edible cannabis product in liquid form may not contain a quantity of THC greater than 5 mg per container.		
Commercial production		Licensed producers	Licensed growers	
Commercial distribution	Distribution: public In-person retail: public Online retail: public	Distribution: public In-person retail: public Online retail: public	Distribution: private In-person retail: private Online retail: private	Distribution: public In-person-retail: private Online retail: public
Restrictions on edibles		An edible cannabis product offered in Québec may not be sweets, confectionery, dessert, chocolate or any other product attractive to persons under 21 years of age.		
Promotion, Packaging, and Labelling		No direct or indirect advertising to promote cannabis, a brand of cannabis, a cannabis producer or the SQDC. Advertising disseminated by signage may be visible only from the inside of an SQDC outlet.		
Taxation **Cannabis excise duty rates in provinces and territories (Department of Finance, Canada)**	Flower: $0.75/g Trim: $0.225/g Seed/seedlings $0.75 **7.5 % of the dutiable amount when delivered to purchaser**	Flower: $0.75/g Trim: $0.225/g Seed/seedlings $0.75 **7.5 % of the dutiable amount when delivered to purchaser**	Flower: $0.75/g plus 6.45% of base amount Trim: $0.225/g plus 6.45% of base amount Seed/seedling: $0.75 seed plus 6.45% of base amount **7.5% plus 6.45 per cent of the dutiable amount of a cannabis product when delivered to a purchaser (total applicable rate of 13.95%)**	Flower: $0.75/g Trim: $0.225/g Seed/seedlings $0.75 **7.5% of the dutiable amount when delivered to purchaser**
Restrictions on use	Illegal to smoke everywhere except private property, some exceptions for certain public spaces.	Illegal to smoke everywhere except for areas where tobacco may be smoked, excluding university and CEGEP campuses.	Illegal to smoke everywhere except private property or residence.	Illegal to smoke everywhere except private property or residence.

TABLE 6 Regulations for the legalization of the non-medical use of cannabis in jurisdictions in the United States

	Alaska	Arizona	California	Colorado	Connecticut
Legal process	Voter initiative, state statute	Voter initiative	Voter initiative	Voter initiative, amendment to state constitution	Legislative
Title	Ballot Measure 2	Proposition 207	Proposition 64	Amendment 64	SB1201
Date passed	November 2014	December 2020	November 2016	November 2012	June 2021
Date implemented/required date of rule adoption	February 2015: Personal possession, consumption, cultivation. October 2016: Retail sales.	DHS to accept licences from early applicants from 19 January 2021 to 9 March 2021. Allow for cannabis deliveries beginning sometime between 1 January 2023 and 1 January 2025.	Licences issued 11 January 2018	December 2012: Personal possession, consumption, cultivation. January 2014: Retail sales.	On 17 June 2021, the Connecticut Legislature passed the bill. The law was signed on 22 June 2021.
Regulatory authority	Alcohol and Marijuana Control Office	Arizona Department of Health Services	Bureau of Marijuana Control	Marijuana Enforcement Division (Department of Revenue)	Connecticut Social Equity Council
Minimum age	21	21	21	21	21
Residency requirement	None	None	Licences not issued to non-residents	None	None
Personal possession limit	28.5 g (1 oz or less) of cannabis	28.5 g (1 oz or less) of cannabis or 5 g or less of concentrate	28.5 g of cannabis plant material and 8 g of concentrated cannabis.	28.5 g	No more than 1.54 oz (44 g) of cannabis on their person, and no more than 5 oz (142.5 g) in their homes or locked in their car, truck or glove box.
Home cultivation	6 plants, 3 of which can be flowering; not subject to public view; within property with lawful possession or with consent of the person in lawful possession.	6 plants, as long as cultivation takes place within an enclosed area with a lock and is not visible from public view.	Plant, cultivate, harvest, dry, or process plants in accordance with local ordinances: Plants are in a locked space, and are not visible by normal unaided vision from a public place. 6 living plants may be planted, cultivated, harvested, dried, or processed within a single private residence; Living plants and any cannabis produced by the plants in excess of 28.5 g are kept within the person's private residence, or upon the grounds of that private residence.	6 plants, 3 of which can be flowering; As of 1 January 2018, all residences are limited to a maximum of 12 plants unless certain requirements are met; The area for growing plants must be enclosed and locked in a separate space that minors cannot access.	As of 1 July 2023, all adults age 21 and over will be permitted to grow up to 6 cannabis plants (3 mature, 3 immature) indoors within their homes.
Interpersonal sharing	28.5 g	Yes, same as personal possession limits plus six plants	Yes	28.5 g	Not allowed
Retail transaction limit	28.5 g In addition, a store may not sell in a day: - More than 1 oz of usable cannabis - More than 7 g of cannabis concentrate for inhalation; or - More than 5,600 mg of THC in combined sales of marijuana and cannabis products.	Not specified	Presumably same limits for personal possession	Residents: 28.5 g Non-residents: 7 g	Retail sales of cannabis aim to begin by the end of 2022
Retail pricing structure	Market	Market/commercial	Market/commercial	Market	Market structure

	Alaska	Arizona	California	Colorado	Connecticut
Maximum THC content	The THC limit in cannabis products is 10 mg per serving. The new rules raise the allowable amount of THC per package to 100 mg.	The potency of edible cannabis products are to be kept "at reasonable levels upon consideration of industry standards", but no more than 10 mg of THC per serving, 100 mg of THC per package, or packages with scored servings within the limits	Standardized concentration of cannabinoids not to exceed 10 mg THC per serving.	The amount is 8 g total of concentrate (except vape cartridges) and 800 mg of THC in any edible product.	30 percent THC by weight for cannabis flower and all other products except pre-filled vape cartridges at 60 percent THC
Registration requirements	None	None	Not specified	None	Not specified
Commercial production	Licensed cannabis producers	Licensed producers	Licensed cultivators and manufacturers, varying types	Licensed cannabis cultivation facilities	Licensed cannabis producers
Commercial distribution	Licensed retail cannabis stores	Licensed stores with limitations; for example, one cannabis establishment licence per 10 pharmacies or no more than two cannabis establishment licences in counties that contain no registered non-profit medical cannabis dispensaries.	Limits on market concentration	Licensed retail cannabis stores	Not specified
Restrictions on edibles	5 mg of THC for single serving, no more than 50 mg of homogenous THC allowed per package. Child-resistant packaging required. Separate warnings on risks, not appealing to children.	The potency of edible cannabis products are to be kept "at reasonable levels upon consideration of industry standards" (see above).	10 mg THC per serving. Warning and potency labels. List of ingredients and cannabinoid content.	Maximum of 10 mg of THC in each individually packed serving; warning labels ""keep out of reach of children""; THC symbol on labels and not attractive to children. Every single standardized serving (10 mg of THC) of an edible retail cannabis product must be individually marked, stamped or imprinted with the universal symbol.	Edible cannabis products are limited to 5 mg of THC per serving.
Advertising	Logo or advertisement for licensed marijuana may not promote excessive consumption, depiction appealing to a person under 21 years of age. Restrictions on advertisements in school areas, public transport, and contain prescribed warning.	Prohibits the advertisement of cannabis products to children and prohibits the advertisement or sale of cannabis products with names that resemble or imitate food or drink brands marketed to children.	Restricted to those over 21. Restrictions on false advertisement or claims of untrue health benefits. Products cannot appeal to children.	Restricted to media with no more than 30% of the audience under the age of 21.	Is not legal to advertise cannabis in Connecticut. Cannabis products cannot be advertised in print, television, radio or on the internet or billboards unless there is “reliable evidence” that at least 90% of the audience is 21 years or older.
Taxation	$50 excise tax per oz on sales or transfers from cultivation facility to retail store or product manufacturer; 1 January 2019, sales and transfers of marijuana are subject to new tax rates. Mature bud/flower are taxed at $50 per oz; immature or abnormal bud is taxed at $25 per oz; trim is taxed at $15 per oz; and clones are taxed at a flat rate of $1 per clone.	"Excise tax of 16% on price of cannabis and cannabis products. Cannabis products are also subject to transaction privilege tax which in 2020 was 5.6% – different jurisdictions also levy TPT retail taxes."	"15% excise on retail, $9.25 per dry weight ounce on flower after harvest. $2.75 per drug weight ounce on leaves. Tax rates for cannabis leaves to be adjusted annually to reflect fluctuations in the relative price of cannabis flowers to cannabis leaves."	State sales tax (2.9%) on cannabis sold in stores; state retail cannabis sales tax (15%) on retail cannabis sold in stores; state retail cannabis excise tax (15%) on wholesale sales/transfers of retail cannabis.	"35% state sales tax, 3% sales tax dedicated to the city or town where the sale occurs. A state cannabis tax based on the amount of THC in the cannabis product: 2.75 cents per mg of THC for cannabis edibles 0.625 cents per mg of THC for cannabis flower 0.9 cents per mg of THC for all other product types "

	Alaska	Arizona	California	Colorado	Connecticut
On site consumption	In-store consumption is allowed; stores can sell cannabis and cannabis products, excluding concentrates, to patrons for consumption on the licensed premises at the time of purchase only in a designated area with further conditions stipulated in the regulation.	Not specified	Not specified although they may exists in the form of microbusiness that allow on-site consumption.	Not allowed	Not specified
Restrictions on use	Cannabis use in public is unlawful; violation punishable by a fine of up to $100.	Cannabis smoking is illegal in public places and open spaces.	Cannabis use is prohobited in a public place unlicensed for such use, including near schools and other areas where children are present.	Not permitted in public places	It is prohibited to smoke in state parks, workplaces, hotels and within 25 feet of an entrance. Communities with a population of 50,000 or more, will have to set up one public place for individuals to be able to smoke/use cannabis.
Medical cannabis	1998: Patient registry with a card, no dispensaries registration; out-of-state patients recognized for approved conditions but not for dispensary purchases; adults over 21 may also purchase at retail adult dispensaries.	2010: adult patients and those under 18. For patients under 18, the patient's custodial parent or legal guardian must be designated as his/her caregiver. Patients require a qualifying patient card which is based on diagnosis with one of the debilitating medical conditions, and a written certification from a physician (medical doctor, osteopath, naturopath, or homeopath licensed to practice in Arizona) with whom the person has a physician-patient relationship.	1996 and 2003; Patient registry - voluntary registration; cooperatives and collectives; State-wide licensing of dispensaries began 2018.	2000: Patient registry, dispensaries already existed; out-of-state patients not recognized; possession, consumption; 2010: commercial production and sales.	Connecticut General Statutes, Chapter 420f, Section 21a-408, An Act Concerning the Palliative Use of Marijuana, was signed into law on May 31, 2012. To qualify for a medical cannabis registration certificate, a patient must be diagnosed by a physician as having one of the debilitating medical conditions set out in the law; 18 years of age; a Connecticut resident; and not an inmate in a Department of Corrections institution or facility.

	District of Columbia	Illinois	Maine
Legal process	Voter initiative	Approved by legislature in May 2019	Voter initiative June 27, 2019, Governor signed into law 129th LD 719
Title	Initiative 71	Bill HB 1438 (Public Act 101-0027)	Question 1 (H.P. 1199 - L.D. 1719)
Date passed	November 2014	Signed by Governor 25 June 2019	November 2016
Date implemented/ required date of rule adoption	February 2015: Personal possession, consumption, cultivation.	Effective 1 January 2020	Take effect on 7 January 2017; regulation for business to be in place August 2017. On 27 January 2017 the legislature approved a moratorium on implementing parts of the law regarding retail sales and taxation until at least February 2018. Law finally took effect on 19 September 2019.
Regulatory authority	Not applicable; separate legislation to regulate commercial production and sale to adults still not passed	Department of Agriculture	Department of Administrative and Financial Services (Office of Marijuana Policy)
Minimum age	21	21	21
Residency requirement	None	Partially required	Not specified
Personal possession quantity	2 oz (57 g) 6 plants (no more than 3 mature)	30 g of cannabis flower; no more than 500 mg of THC contained in cannabis infused product; 5 g of cannabis concentrate Half of these amounts allowed for non-residents	71.25 g (2.5 oz) Concentrates up to 5 g
Home ultivation	6 plants per person, 12 plants per household, 6 of which can be flowering.	Cultivation is allowed for qualifying persons under ""Compassionate Use of Medical Cannabis Pilot Programme Act"" Plants, with a limit of 5 plants that are more than 5 inches tall, per household without a cultivation centre or craft grower licence. Cannabis cultivation must take place in an enclosed, locked space. Adult registered qualifying patients may purchase cannabis seeds from a dispensary for the purpose of home cultivation. Seeds may not be given or sold to any other person. Cannabis plants shall not be stored or placed in a location where they are subject to ordinary public view.	3 flowering marijuana plants, 12 immature plants and unlimited seedlings. An adult may possess all of the cannabis produced by the plants. Property owners can prohibit home cultivation. Cultivation for medical purposes not subject to same restrictions. Plants must be tagged with the cultivator's name, driver's licence or ID number, and — if the plants are not on land owned by the cultivator — the name of the property owner.
Interpersonal sharing	28.5 g or less (transfer without payment)		Same as personal possession limits; in addition no more than 6 seedlings or immature plants;
Retail transaction limit	Not applicalbe	Not applicable	28.5 g (1 oz); 12 seedlings
Retail pricing structure	No retail market	Market	Market/commercial
Maximum THC content	Not set initially	Initially 100 mg of THC per package; Department of Agriculture may change maximum level of THC contained in each serving of cannabis infused product. Allow possession of cannabis-infused products such as capsules, consumables, tinctures, and other edibles that contain no more than 500 mg of THC.	Edible marijuana products: may not contain more than 10 mg of THC per serving may not contain more than 100 mg of THC per package
Registration requirements	None	Non-residents are allowed half the amounts allowed for residents	Not specified
Commercial production	None	Licensed cultivators and craft growers (who cultivate, dry, cure and package cannabis for sale)	Licensed cultivators; two types based on size

	District of Columbia	Illinois	Maine
Commercial distribution	None	Licensed dispensers both for medical and non-medical use	State authority may not limit total number of stores; localities may regulate number and location of establishments.
Restrictions on edibles	Currently not allowed	Allowed but with information and warning on consumption	Edibles may not contain more than 10 mg of THC per serving of the product and may not contain more than 100 mg of THC per package of the product.
Advertising	Not applicable, no commercial market	Businesses cannot place advertisements that have false or misleading claims; or advertisements that promote overconsumption; depict actual consumption; depict a person under 21 consuming; make health, medicinal or therapeutic claims; contain images that can be appealing to minors or children; advertisements are not allowed within 1,000 feet of school or playground, public park or library, public transport or public property; no sales promotions are allowed; similar restrictions apply on packaging and labelling. Health warnings to be legibly displayed.	Restricted to those over 21. Restrictions on false advertisement or claims of untrue health benefits. Products cannot appeal to children.
Taxation	Not applicable, no commercial market	10% sales tax on cannabis flower or products with less than 35% THC; 20% tax on cannabis-infused products such as edibles; 25% tax on products with a THC concentration higher than 35%; Illinois municipalities and counties are able to levy additional local sales taxes. 6.25% State Retailers' Occupation Tax; Consumers may pay between 19.55% and 34.75% depending on a product's potency.	10% excise tax on retail; 15% excise tax on sale or transfer from a licensed commercial cultivation to licensed retail store.
On site consumption	Not allowed; currently under investigation by city task force.	Local jurisdictions and retail outlets may or may not allow; designated cannabis-centred businesses lounges.	State-licensed clubs
Restrictions on use	Not permitted in public places (use on private property is permitted)	Smoking cannabis is not allowed in any place where smoking is prohibited under the Smoke Free Illinois Act.	Not permitted in public places (permiited use in private property or smoking in a state-licensed marijuana social club).
Medical cannabis	1998/2010: Patient registry; dispensaries allowed.	Compassionate use of medical cannabis pilot programme act, began in August 2013. Eligible patients with a doctor's recommendation, with a recognized debilitating condition, after registering with the state, may legally consume medical marijuana. Purchase limit is 2.5 oz of cannabis flower every 14 days. New law also allows school nurses or administrators to give cannabis products to students who are registered medical patients and permits students to medicate under the supervision of those officials.	1999: Patient registry or identification card; dispensaries, recognizes patients from other states but not for dispensary purchases.

	Massachusetts	Michigan	Montana	Nevada	New Jersey	New Mexico
Legal process	Voter initiative	Voter initiative	Voter initiative	Voter initiative	Voter initiative	Legislative process
Title	Question 4 Mass. General Laws c.94G	Proposal 18-1	Initiative 190	Question 2 Title 56 Nevada Revised Statutes 678	Question 1 New Jersey Cannabis Regulatory, Enforcement Assistance, and Marketplace Modernization Act (A-21 (P.L.2021,c.16)	HB 2 Cannabis regulation act passed by legislature 31 March 2021
Date passed	November 2016	6 December 2018	November 2020	November 2016	November 2020	March 2021
Date implemented/ required date of rule adoption	15 September 2017. Licences issued starting 1 October 2017. Law updated on 20 June, 2019.	Commercial licences application began by 6 December 2019.	Application for licensure by 1 January 2022.	Took effect on 1 January 2017 and regulations were in place by 1 January 2018. Cannabis regulation effective 1 July 2020.	The Cannabis Act was signed on 22 February 2021 and went into immediate effect.	Signed by governor on 12 April 2021. Sales began in April 2022.
Regulatory authority	1) Cannabis Control Commission and Cannabis Advisory Board	Marijuana Regulatory Agency	Department of Revenue	Cannabis Compliance Board	Cannabis Regulatory Commission	Cannabis Control Division to be established by September 2021
Minimum age	21	21	21	21	21	21
Residency requirement	Not specified	Not specified		Not specified	None	None
Personal possession limit	1 oz flower (28.5 g) 5g concentrate or 10 oz at home	2.5 oz (70.8 g) on person with no more than 15 g in the form of concentrate and 10 oz (283 g) at home	28.5 g (1 oz) or 8 g in concentrated form	28.5 g (1 oz) flower 1/8 oz or 3.5 g concentrate or edible	28.5 g (1 oz) of cannabis or its equivalent	56 g (2 oz) 16 g of cannabis concentrates and 800 mg of infused edibles
Home cultivation	6 plants, 12 in a single residence away from view; 10 oz of dried marijuana permitted at home.	Up to 12 plants per household not visible from a public place.	4 plants with only 2 mature at any time; maximum number of plants allowed in a single residence is twice the individual limit.	6 plants, no more than 12 on property in indoor or in enclosed with permission of landlord and must be 25 miles away from retail cannabis store.	Home cultivation is prohibited.	6 plants per person, or 12 per household; away from public view.
Interpersonal sharing	1 oz of cannabis	2.5 oz with a max of 15 mg of concentrate as long as money is not exchanged.	Less than twice the amount of personal possession limit without any consideration or remuneration.	Presumably same as personal possession limit	Not yet	Same as personal possession limits.
Retail transaction limit	Up to 1 oz can be given to another adult 21 or older	Up to 2.5 oz (70 g) of cannabis flower 15 g of extract or concentrate	Under the new law customers may purchase up to 1 oz of cannabis per transaction, or the THC equivalent in other forms: 800 mg of edibles or 8 g of concentrate.	Not specified, presumably same limits as for personal possession.	Adults can legally purchase up to 1 oz of cannabis through a licensed retailer	Same as personal possession limits.
Retail pricing structure	Market/commercial	Market/commercial	Market/commercial	Market/commercial	Market/commercial	Regulated market started in April 2022
Maximum THC content	Not set initially	Not set	Not specified	Not set initially	Not set	Not specified
Registration requirements	Personal data collection not required	None	None	Personal data collection not required	None	None

	Massachusetts	Michigan	Montana	Nevada	New Jersey	New Mexico
Commercial production	Licensed establishments	Licensed establishments	Licensed	Licensed establishment	Licensed	Licensed cultivation/ production. Small cannabis microbusinesses can grow up to 200 plants.
Commercial distribution	Licensed establishments; localities can regulate, limit or prohibit the operation of businesses.	A municipality may completely prohibit or limit the number of establishments operating.	Licensed	Limits on market concentration by population	Licensed establishments	Licensed
Restrictions on edibles	Edibles are limited to 5 mg of THC per single serving. The entire package cannot have more than 20 servings for a combined total of 100 mg of THC.	Except for THC limits (see above)	Edibles are limited to 100 mg per package, with no more than 10 mg of THC per serving, as a common industry standard. Cannabis infused products may not be in shapes or packages that are attractive to children or that are easily confused with commercially sold candy.	Single-serving edible cannabis product offered for sale to a consumer containing not more than 10 mg of THC.	Edible cannabis product shall contain no more than 10 mg of active THC per unit of sale.	Not specified
Advertising	Restricted advertising for medical and adult-use cannabis licenses, prohibiting television, radio, podcast, internet, mobile app, social media, billboard and print ads unless at least 85% of the audience is reasonably expected to be 21 years of age or older.	Restrictions on public signs related to cannabis establishments.	Advertising cannabis is prohibited in any medium including electronic media.	A licensed marijuana establishment cannot engage in advertising that contains any false or misleading statements, promotes overconsumption, depicts actual consumption, or appeals to minors. Also applies 70/30 rule from Colorado.	Restrict advertising of cannabis items and cannabis 41 paraphernalia in ways that target or are designed to appeal to individuals under the legal age to purchase cannabis items includes objects, such as toys, characters, or cartoon characters suggesting the presence of a person under 21 years of age or any other depiction; also advertising on television and radio between 6:00 to 22:00 is prohibited; also prohibited to sponsor sports or cultural events.	Advertising cannabis to people under 21 is prohibited, with the use of cartoon characters or other imagery likely to appeal to children forbidden. Advertisements will also be barred from billboards or other public media within 300 feet of a school, day-care centre or church
Taxation	10.75% excise tax on retail sales. 6.25% state sales tax applies to retail purchases of all cannabis products. Up to 3% local excise tax, optional, on retail purchases of all products.	10% excise tax	20% of the retail price	15% excise on wholesale sale. 10% excise tax on retail sale.	General state sales rate of 6.625%; Annually adjusted excise fee based on average retial price: up to $10 per ounce if the average retail price of an ounce was $350 or more; up to $30 per ounce if the average retail price of an ounce was less than $350 but at least $250; up to $40 per ounce if the average retail price of an ounce was less than $250 but at least $200; and up to $60 per ounce if the average retail price of an ounce was less than $200.	12% excise tax to be gradually increased to 18% by 2030; plus 8% regular state sales tax.

	Massachusetts	Michigan	Montana	Nevada	New Jersey	New Mexico
On site consumption	Not allowed, although they may exist in establishments that allow on-site-consumption.	Not specified	Not specified	On-site consumption lounges are permitted	Allowed in designated "Cannabis Consumption Areas" (also known as "on-site consumption areas") attached to places that sell legal cannabis.	Is allowed if businesses offer
Restrictions on use	Cannot use cannabis in a place where smoking tobacco is prohibited	Not permitted in public places or places where prohibited by person who owns, occupies or manages the property, allowed in designated public places that are not accessible to persons under 21 years of age.	Not permitted in public places where smoking tobacco is prohibited, unless allowed by the department.	Cannabis consumption is for private use only. It is illegal to smoke in public, on federal land or in a vehicle without risking a fine.	Consumption is only permitted in a private residence.	Public consumption remains illegal, but business can offer on-site consumption if certain requirements are met.
Medical cannabis	2012/2013; patient registry or identification cards; dispensaries, out-of-state patients not recognized.	2008: patient registry, dispensaries can be established with local ordinances; dispensation for specific conditions, recognize out of state patients only for legal protection of possession but not for dispensary purchases.	2004: Registered card holders; signed physician statement for a debilitating condition.	2000: Patient registry or identification card, No dispensaries; recognize out of state patients if other state's programmes are substantially similar; patients must fill out Nevada paper work.	2009: Medical cannabis can be purchased from any state-licensed New Jersey cannabis dispensary. Physicians determine the proper dosage allowed for the patient, with a maximum set at 3 oz for a 30-day period. Each dose is sold in 0.25 oz denominations. Visiting patients with valid medical marijuana cards from their home state are granted the same protections and allowances surrounding possession and consumption as New Jersey resident cardholders.	2007: In 2020, registered patients are required to be state residents; patients need to have a certification from a prescriber with the qualifying conditions; patients are allowed to possess no more than 230 units (approx. 8 oz of flower or buds).

	New York	Oregon	South Dakota	Vermont	Virginia	Washington
Legal process	Legislative process	Voter initiative, state statute	Voter initiative	Legislative process	Legislative	Voter initiative, state statute
Title	Assembly bill A1248 A Marijuana regulation and taxation act	Measure 91		No. 86 S.54 (initiated in February 2020 and went into force in October 2020 without the Governor's signature	SB 1406 Marijuana; legalization of simple possession Signed by governor on 7 April 2021	Initiative 502
Date passed	31 March 2021	November 2014	November 2020	January 2018	April 2021	November 2012
Date implemented/ required date of rule adoption	Assembly bill signed by governor on 31 March 2021; Sales may begin in December 2022.	July 2015: Personal possession, consumption, cultivation. October 2015 up to December 2016: Retail sales through medical dispensaries January 2017: Retail sales through licensed retailers.	Anticipated date of implementation was 1 April 2022. The ballot measure overturned by courts in February 2021.	1 July 2018 Sale regulations effective October 2020	Effective July 2021, Bill provisions are subject to re-enactment by the 2022 Session of the state General Assembly. Sales beginning and regulations taking effect on 1 January 2024.	December 2012: Personal possession, consumption July 2014: Retail sales.
Regulatory authority	Cannabis Control Board	Oregon Liquor Control Commission	Department of Revenue	Cannabis Control Board (proposed under S.54)	Virginia Cannabis Control Authority Cannabis Oversight Commission; Cannabis Public Health Advisory Council Cannabis Equity Reinvestment Board and Fund, and Virginia Cannabis Equity Business Loan Program and Fund	Liquor and Cannabis Board (formerly the Liquor Control Board)
Minimum age	21	21	21	21	21	21
Residency requirement	None	None	None	None	None	None
Personal possession quantity	85.5 g (3 oz) or 24 g of concentrated cannabis	In public: 28.5 g; At home: 228 g	28.5 g (1 oz or less) or 8 g of concentrate	28.5 g (1 oz) or less or 5 g or less of concentrates (e.g., hashish oil)	28.5 (1 oz) or less	Flower 1 oz (28.35 g) Concentrates; 7 g Edibles 16 oz (454 g) Infused liquid 72 fl oz (2.13 l)
Home cultivation	6 plants, 3 mature and 3 seedlings, or up to 12 per household.	4 plants in flower.		2 mature plants or 7 immature plants.	Up to 4 plants for personal use per household. The plants should be kept away from public view, and each one should have a legible tag with owner's ID.	Not allowed
Interpersonal sharing	Same as personal possession limits but without compensation.	Gifting of recreational cannabis to adults 21 and older is allowed, so long as the amount gifted falls within the personal possession limits and no financial consideration is associated with the transfer.		28.5 or 1 oz or less, or 5 g or less	Yes, same as personal limit.	Not allowed

	New York	Oregon	South Dakota	Vermont	Virginia	Washington
Retail transaction limit	To be determined.	1 oz dried flower 5 g cannabinoid extracts or concentrates 16 oz edible form 72 oz cannabis in liquid form 10 cannabis seeds 4 immature cannabis plants		1 oz or cannabis or equivalent in cannabis products	28.5 g (1 oz) or equivalent	28.5 g
Retail pricing structure	Market/commercial	Market		Market	Market with limitation	Market
Maximum THC content	Not set	Not set initially		Flower is capped at 30% THC and concentrates cannot exceed 60% THC. Edibles have a 50 mg limit per package, 5 mg per serving.	Not specified	Not set initially
Registration requirements	None	None		None	None	None
Commercial production	Licensed	Licensed cannabis producers		Licensed	Number of licences not to exceed: a) Marijuana manufacturing facilities, 60; and b) Marijuana cultivation facilities, 450	Licensed cannabis producers
Commercial distribution	Licensed establishments. Existing medical cannabis operators will be allowed to operate three adult-use stores, co-locating them with their medical dispensaries.	Licensed retail cannabis stores		Licensed	Number of licences issued shall not exceed the following limits: a) Retail cannabis stores, 400; b) Cannabis wholesalers, 25.	Cannabis can only be sold and purchased at state-licensed retail stores.
Restrictions on edibles	None	Edibles produced for recreational consumers are limited to 5 mg for a single dose and 50 mg for an entire package. Edibles concentration limits increased from 50 mg THC to 100 mg per package on and after April 1, 2022. Single serving portions (of no more than 10 mg THC) is scored, to make the portion sizes obvious.		Edibles can have up to 50 mg of THC with serving of no more than 5 mg of THC each.	Not to contain more than 5 mg of THC per serving of the product; and shall not contain more than 50 mg of THC per package of the product.	10 mg of THC in each individually packaged serving; child-proof packaging; THC labelling; marijuana-infused products, packages and labels to be approved by the State Liquor Control Board before sale.

	New York	Oregon	South Dakota	Vermont	Virginia	Washington
Advertising	The board is authorized to promulgate rules and regulations governing the advertising	Entry sign required on exterior of dispensaries; Oregon Liquor Control Commission has authority to further regulate or prohibit advertising.		Advertising could not be deceptive, promote overconsumption, offer free samples, or be appealing to minors. Advertising would only be allowed where the licensee can reasonably expect no more than 15% of viewers will be under 21.	Board to regulate reasonable restrictions on advertising and promotion of products.	Cannabis business licensees are limited to two permanent signs on their licensed premises, and all other forms of outdoor advertisements on the premises are banned. New rules mandated that billboards and signs can no longer contain images of the cannabis plant or cannabis products. Cannot contain depictions of cartoon characters or any depictions that may be appealing to children.
Taxation	Proposed tax is 13%. Wholesale tax will be applied to products based on potency (0.5 cent per mg for flower, 8/10th of a cent per mg for concentrated cannabis and 3 cents per mg for edibles).	No tax on retail sales from October 2015 to December 2015; 25% sales tax after 5 January 2016; 17% sales tax in 2017 with options for local communities to establish local tax up to 3% .	15% tax proposed	14% of sales price of retail sale	20% retail sale tax	37% cannabis excise tax; Sales Tax: 7.0-10.4% (Option to apply existing local sales taxes (0.5-3.1%)).
On site consumption	Is allowed	Not allowed		Maybe allowed	Not specified	Not allowed
Restrictions on use	Smoking cannabis in any location is prohibited where smoking tobacco is prohibited.	Smoking marijuana in public is illegal.	Prohibited in public places other than in an area licensed by the Department for consumption; smoking in a location where smoking tobacco is prohibited.	Use is limited to individual dwellings. Prohibited in street, alley, park or sidewalk in addition to usual smoke free places.	Public use of cannabis will be prohibited.	It is illegal to consume cannabis in view of the public.
Medical cannabis	2014: Registration and ID card, medical cannabis to be given either to a certified patient (resident of the state) or by a designated caregiver for a certified medical use for defined "severe debilitating or life threatening conditions.	1998: Patient registry, dispensaries already existed but not clearly authorized by law or regulated; possession, home cultivation.	2020: court ruled it unconstitutional.	Department of health reviews application of qualifying patients diagnosed with qualifying conditions; DoH verifies the condition with the physician.	2020: Registration is based on certification from a practitioner for specified conditions.	1999/2010/2011: no registration or identification card; dispensaries approved as of November 2012, first stores opened in July 2014; 1999 possession; 2012 home cultivation.

TABLE 7 Regulation for the legalization of the non-medical use of cannabis in Uruguay

	Uruguay
Legal process	Government initiative, national law
Title	Law No. 19.172
Date passed	December 2012
Date implemented/required date of rule adoption	August 2014: Personal cultivation October 2014: Grower clubs Mid-2017: Pharmacy sales
Regulatory authority	Institute for the Regulation and Control of Cannabis (IRCCA)
Minimum age	18
Residency requirement	Uruguayan citizenship or permanent Uruguayan residency required
Personal possession limit	Individuals can purchase up to 40 g per month; according to subsequent regulations, the limit is 10 g per week.
Home cultivation	Six plants in flower. These plants are not allowed to yield more than 480 g of marijuana per year.
Interpersonal sharing	Allowed within the home
Retail transaction limit	40 g per month, 10 g per week (sale through pharmacies to registered users)
Retail pricing structure	Government price control
Average retail price per gram after tax	265 Uruguayan pesos per 5 g (approx. $1.2 per gram)
Maximum THC content	All products are required to indicate that CBD is equal to or more than 3% and THC is equal to or less than 9%
Registration requirements	With IRCCA for any of the three modes of access
Commercial production	Licensed producers
Commercial distribution	Licensed pharmacies
Restrictions on edibles	
Advertising	Prohibited
Taxation	No tax, although IRCCA can impose tax in the future
Cannabis clubs	Clubs with 15-45 members allowed to cultivate up to 99 plants, maximum 480 g of dried product per member per year
Restrictions on use	Uruguay's cannabis law forbids cannabis use in indoor public spaces where tobacco use is prohibited.
Medical cannabis	In 2013: Passed (Law 19.172). Decree N° 46/015. Oils under prescription (CBD) and cosmetics with CBD currently for sale in pharmacies.

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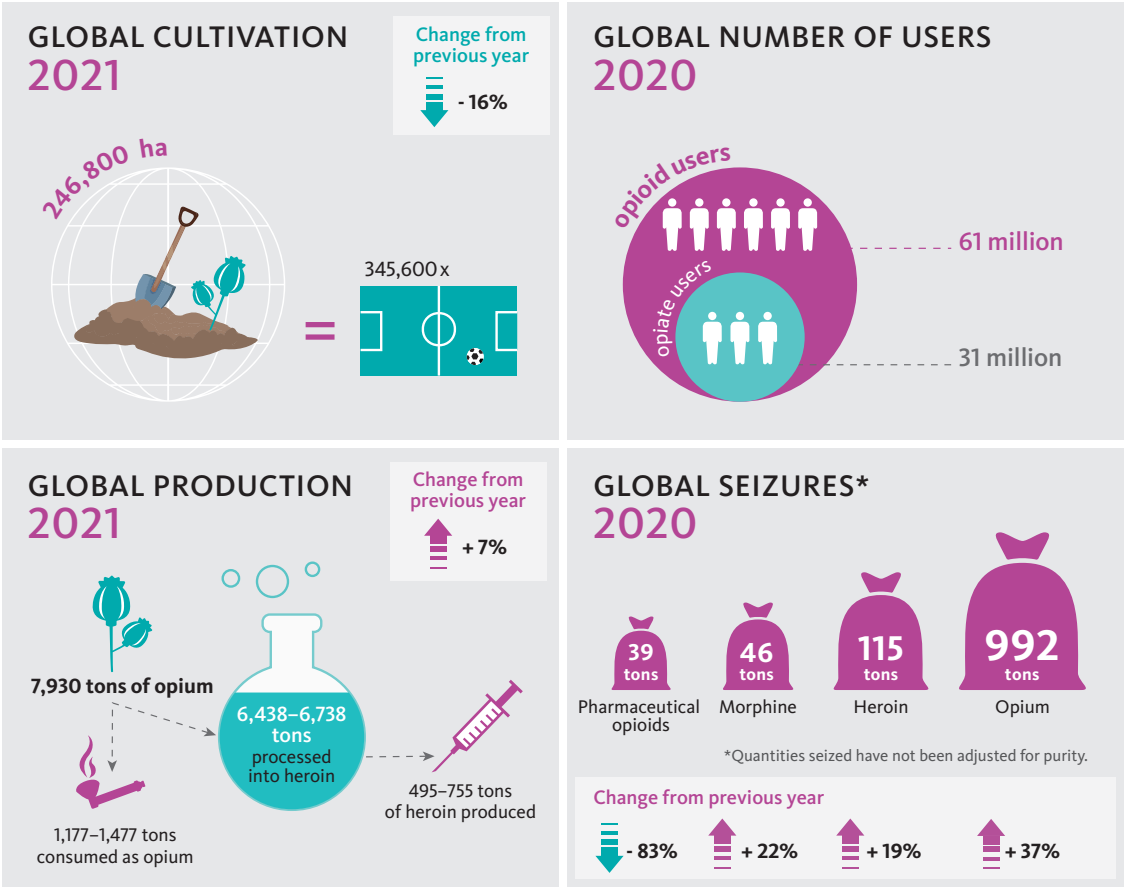
OPIOIDS

Overview: the opioids drug group – a large family of substances

Opioids are a group of drugs comprising a range of substances, including opiates and their synthetic analogues, that act on the opioid receptors mu (μ), delta (Δ) and kappa (K) in the human body, depress breathing, increase feelings of pleasure and block pain messages of the nervous system.[1] Opiates are the naturally occurring alkaloids found in opium poppy and include morphine, codeine and thebaine. Their semi-synthetic derivatives include heroin, hydrocodone, oxycodone, and buprenorphine. The class of opioids also includes a range of synthetic or pharmaceutical opioids, such as methadone, pethidine, tramadol, and fentanyl.[2]

Patterns of non-medical opioid use: overlaps, substitution, self-medication, and inadvertent exposure

Opioids generally have a high abuse liability, but the particular abuse liability of any specific opioid is



Example of the interplay between different opioids: United States

The opioid market in the United States has historically fluctuated between the use of heroin and the non-medical use of pharmaceutical opioids. The epidemic of non-medical opioid use is now seeing heroin laced with or sometimes entirely replaced by fentanyls.

The non-medical use of pharmaceutical opioids began increasing in 1997, coinciding with an increase in prescriptions of opioids for pain management, particularly for chronic non-cancer-related pain management, and between that year and 2005, the number of such prescriptions surged more than 500 per cent.[i]

Among the factors altering trends of increased initiation into the non-medical use of pharmaceutical opioids was that such opioids were considered safer than heroin, as they did not carry the stigma of using an "illicit" drug and were less affected by fluctuations in quality or dosage. A study carried out in the period 2010–2013 showed that recent new users of opioids were more likely to be older men and women living in less urbanized areas (75 per cent of such users) who had been introduced, in most cases (75 per cent of cases), to opioids through pharmaceutical drugs;[ii] this stands in contrast to respondents who began using heroin in the 1960s, who were predominantly young men (83 per cent) and whose first opioid used was mostly heroin.

Beginning in 2006, a gradual increase in heroin use was observed in parts of the United States, attributed mainly to the availability of cheaper heroin with higher purity and a change in the formulation of pharmaceutical opioids, making them crush-proof and less liable to misuse. The transition from the non-medical use of pharmaceutical opioids to the use of heroin, especially among young people, has been, in many cases, part of the progression of addiction in a subgroup of users who considered it too costly to maintain their patterns of use and switched to heroin, as they considered the drug more reliably available through drug dealers, more potent and more cost-effective than pharmaceutical opioids.[iii]

Between the periods 2002–2004 and 2011–2013, heroin use increased by 139 per cent among those who self-reported the non-medical use of pharmaceutical opioids.[iv] A study that looked at national data for the period 2002–2004 found that, among the population aged 18 and older, heroin users had been 3.9 times more likely to report the non-medical use of opioids in the previous year and 2.9 times more likely to meet the criteria for abuse of or dependence on opioids than people who did not use heroin.[v]

Experience from the United States has shown that, under certain conditions, an increase in the availability of heroin at competitive prices can lead to a general increase in heroin use, despite the substance's negative image.[vi] The increase in the availability of heroin recorded between 2005 and 2018[vii] was driven by the existing population of misusers of prescription opioids. Following improved controls over the prescribing of pharmaceutical opioids, that group mainly switched to heroin.[ii]

It is estimated that in 2020 9.5 million people in the United States had used opioids non-medically in the past year. Of these, 9.3 million people had used pharmaceutical opioids non-medically, 902,000 people had used heroin, and about 700,000 people had used both[viii] heroin and pharmaceutical opioids (non-medical use). In parallel, theer has been a marked increase in post-mortem findings of heroin in cases of death due to drug overdose.[ix]However, most of the recent increases in overdose deaths attributable to heroin in North America seem to be driven by fentanyls that are mixed with heroin by drug dealers or traffickers.[x]

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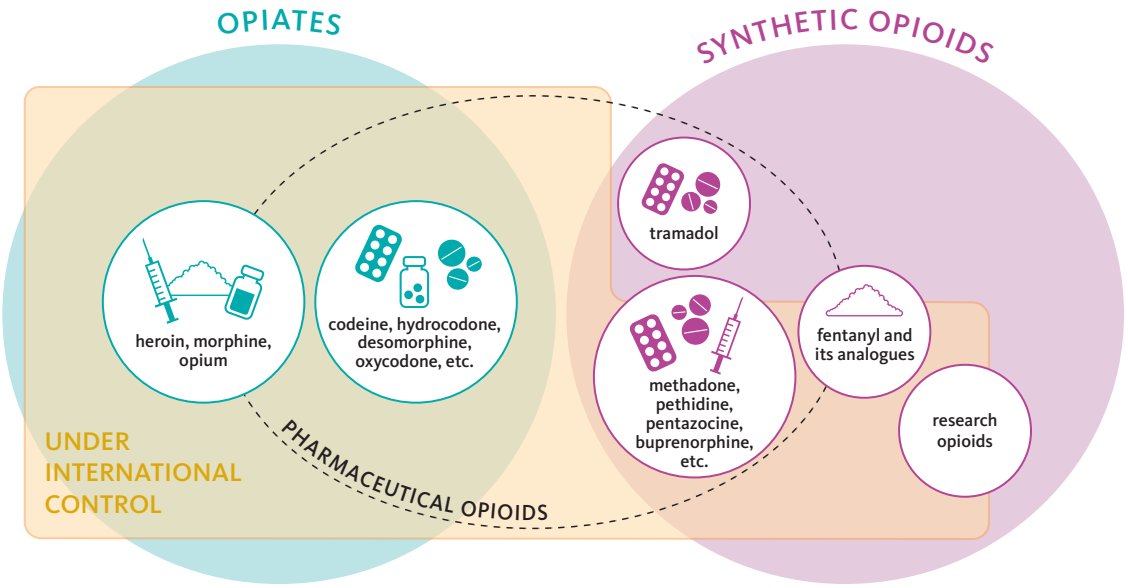
x United States Department of Justice, Drug Enforcement Administration, *2020 National Drug Threat Assessment*, 2021.

FIG. 45 Opioids for medical and non-medical purposes



Source: UNODC elaboration.

determined by many factors.[a] These include the ease with which the opioid can cross the blood-brain barrier (drug lipophilicity), which differs from person to person, its binding affinity to opioid (mainly μ) receptors, and various pharmacokinetic characteristics such as the ease with which it can be injected or otherwise used.[3] Opioid use and dependence are also influenced by availability, market dynamics,[4] economic factors including cross-price elasticity,[5] and may differ from person to person.

The *World Drug Report 2021* described three different scenarios in the interplay of the use of different opioids that play a key role in the dynamics of non-medical opioid use epidemics across countries:

- Typically used opioids are substituted with other opioids, or new opioids are experimented with, depending on their price, purity, and effects and side-effects perceived by the user, as well as availability and control measures.
- Different opioids are used consecutively or sequentially to self-medicate or manage withdrawal, including during opioid agonist[b] or antagonist[c] therapy.
- Novice or regular users of opioids, and sometimes even primary users of other, non-opioid drugs, are inadvertently exposed to opioids used as adulterants or cutting agents for substances already established in the market.

a For a more detailed discussion, see the *World Drug Report 2021*.

b According to the WHO *Lexicon of Alcohol and Drug Terms*, an agonist is a substance that acts on neuronal receptors to produce effects similar to those of a reference drug. For example, methadone is an agonist of morphine at the opioid receptors.

c According to the WHO *Lexicon of Alcohol and Drug Terms*, an antagonist is a substance that counteracts the effects of another substance or agent. Pharmacologically, an antagonist interacts with a receptor to inhibit (counter or stop) the action of the substance that produces specific effects mediated by that receptor. Methadone is an opioid agonist, whereas buprenorphine is an agonist and partial antagonist of opioid receptors.

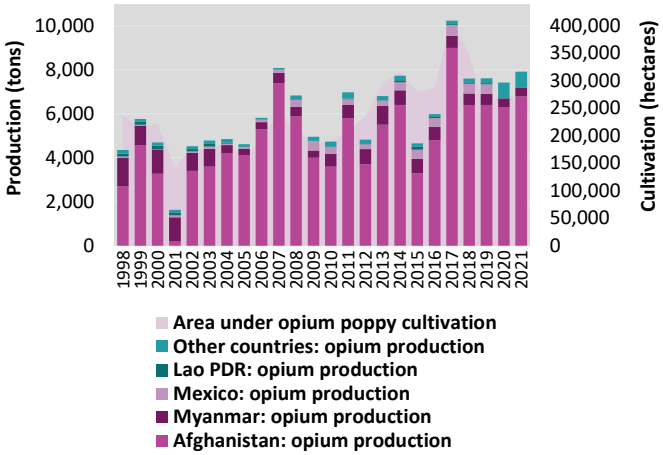
Global supply of opioids

Global supply of opiates

Opium production remains concentrated in three countries

Of the 57 countries where illicit opium production was reported over the last decade, three alone collectively accounted for 97 per cent of estimated illicit opium production in the period 2017–2021. Afghanistan remained by far the world's largest source of opium, accounting for an estimated 86 per cent of global illicit production in 2021. Afghan opium supplies markets all over Eurasia and Africa, and a negligible proportion reaches North America and Oceania. Opium produced in South-East Asia, mostly in Myanmar (6 per cent of global production) and the Lao People's Democratic Republic (about 1 per cent), supplies markets in East and South-East Asia and Oceania, while opium produced in Latin America, mostly in Mexico (close to 6 per cent) and to a more marginal extent in Colombia and Guatemala (less than 1 per cent), accounts for most of the heroin supplied to the United States and the relatively limited heroin markets of South America.

FIG. 46 Opium poppy cultivation and production of opium, 1998–2021



Source: UNODC calculations based on UNODC illicit crop monitoring surveys and on responses to the annual report questionnaire.

Note: Data for 2021 are preliminary.

Estimated area under opium poppy cultivation decreased in 2020

The global area under opium poppy cultivation decreased by 16 per cent, to 246,800 ha, in 2021, primarily owing to a decrease in Afghanistan of 21 per cent, to 177,000 ha,[6] although the area under cultivation in that country was still higher than in 2019, and 35 per cent higher than in 2011.[7]

The area under opium cultivation in Myanmar increased slightly, by 2 per cent to 30,200 ha, in 2021,[8] reversing a trend in which the area had decreased by almost 50 per cent between 2013 and 2020.[9] Shan State, bordering China, Lao People's Democratic Republic and Thailand, continued to be the opium hub for Myanmar, accounting for 82 per cent of the country's total area under poppy cultivation, with most of the rest found in the neighbouring Kachin and Kayah states.[10]

No new data for Mexico were available. Data for the period from 1 July 2018 to 30 June 2019 showed a decrease in the area under opium poppy cultivation of 23 per cent compared with the preceding 12-month period, to 21,500 ha. Data also showed that opium poppy cultivation was concentrated in six states located along or close to the Pacific coast, notably the states of Sinaloa and Chihuahua, in the north, and the state of Guerrero, in the south.[11]

Global opium production increased slightly in 2021

Despite the decreasing area under opium poppy cultivation, global opium production continued its long-term upward trend in 2021, growing 7 per cent year-on-year, to 7,930 tons, less than the peak of 10,240 tons reached in 2017.

The increase in 2021 was largely attributable to an increase in opium production in Afghanistan (8 per cent) resulting from a marked increase in opium yields in the country, from 28 kg per ha in 2020 to 38 kg per ha in 2021,[12] and thus back to the levels observed in 2019, a year in which neither crop diseases, pests nor droughts were reported in the main poppy growing areas of the country.[13] The yield figure in Afghanistan thus continued to be considerably higher than in Mexico (about 21 kg per ha in 2018/19)[14] and Myanmar (about 14 kg per ha in 2021),[15] although still below reported opium yields from licit opium production.[16]

In parallel, opium yields also improved in Myanmar in 2021, such that overall opium production in that country rose by 4 per cent in 2021 to 30,200 ha,[17] thus reversing the downward trend observed in previous years (a decrease of 53 per cent between 2013 and 2020).[18]

Global manufacture of heroin seems to have stabilized

Taking opium consumption into account, estimated global opium production in 2021 would have been sufficient to potentially manufacture 495–755 tons of heroin (expressed in export purities), similar to 2020 (454–694 tons)[19] and 2019 (472–722 tons).[20] However, the global amount of heroin available for consumption was lower than this estimate, owing to seizures of opium, morphine and heroin, and it could change depending on the inventories accumulated or released by traffickers between sources and destinations.

Seizures of opiates surge to a record high in 2020

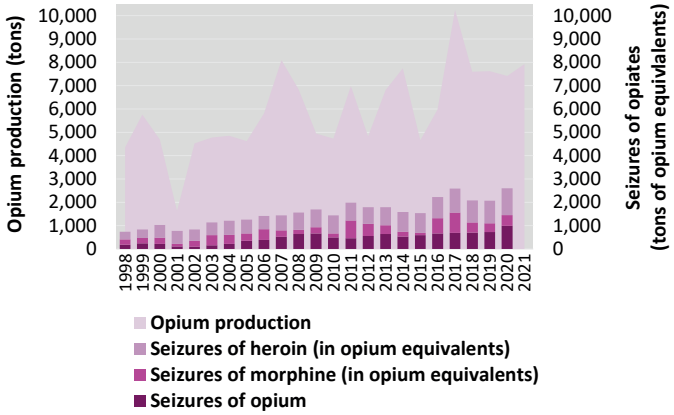
Seizures of opiates soared almost 40 per cent in 2020, reaching a new record high.[d] Seizures of opium increased by 37 per cent, seizures of morphine by 116 per cent and seizures of heroin by 20 per cent.

Interceptions of opiates continued a long-term upward trend, with quantities seized more than doubling in the period 2000–2020. The increase in seizures was most pronounced for opium, which is primarily seized close to the main production centres. Interception rates for opium – the percentage of estimated opium produced that was reported seized in the form of opium – rose from 5 per cent in 2000 to 13 per cent in 2020.[21]

Over the last two decades, the growth in seizures of opiates (expressed in opium equivalents) has been faster (close to 160 per cent between 2000 and 2020) than the growth in opium production (close to 60 per cent), suggesting that interception rates (the proportion seized) have increased. At the same time, data suggest that the quantities of opiates that have not been seized and that are available for consumption have increased during the past two decades, although a lack of accurate data on purity and uncertainty with regard to estimates of heroin manufacture, opiate seizures expressed in heroin equivalents, and changes in opiate stocks prevent the calculation of precise figures.

d These calculations are based on an assumed conversion ratio of 10 kg of opium per 1 kg of morphine or heroin.

FIG. 47 **Global opium production, 1998–2021, and quantities of opiates seized, 1998–2020**



Sources: UNODC, opium surveys in selected countries and responses to the annual report questionnaire; and other government sources.

Note: A ratio of 10:1 was used to convert quantities of opium into heroin equivalents.

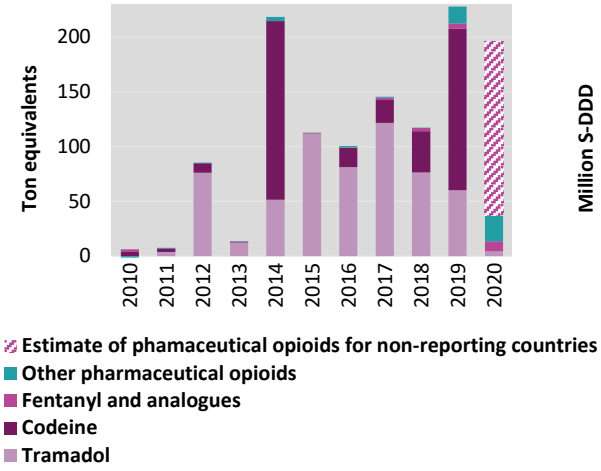
Supply of other opioids

2020 shows a decline amid a long-term upward trend

Seizures of pharmaceutical opioids have shown an apparent upward trend over the last decade, despite a decrease in reported seizures of 83 per cent in 2020.

However, most of the decrease in 2020 is attributable to non-reporting by Member States, notably in West and North Africa (where trafficking in tramadol for non-medical use is a major threat) and Asia (where codeine misuse is widespread).[22] Assuming that these non-reporting countries seized, on average, similar quantities of pharmaceutical opioids as in the previous year, the overall decrease in 2020 would be reduced to 14 per cent, and the figures for 2020 would still be among the highest in recent years.

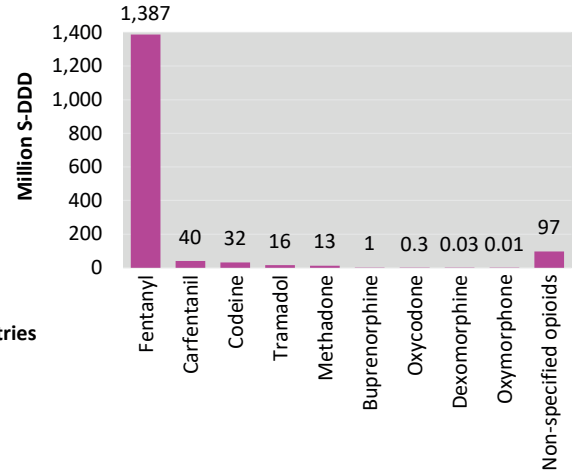
FIG. 48 Global quantities of pharmaceutical opioids seized, 2010–2020



Source: UNODC, responses to the annual report questionnaire.

Notes: The data refer to seizures of opioids reported by Member States to UNODC in the former version of the annual report questionnaire, under the category "pharmaceutical opioids". For the new version of the annual report questionnaire, the following categories were used as proxies: seizures of buprenorphine, codeine, desomorphine, fentanyl and its analogues, methadone, oxycodone and tramadol, as well as the general category of pharmaceutical opioids. Not all these substances, however, are necessarily intended for medical use in humans; some are also used in veterinary medicine. Among the fentanyl analogues approved as pharmaceutical drugs for human use are alfentanil, fentanyl, remifentanil and sufentanil. One (carfentanil) is approved for veterinary use. Some Member States also report substances (such as furanylfentanyl) that are, in general, not approved for medical use. Data on seizures for 2020 reported by Member States to UNODC showed a significant decline, which, however, does not necessarily indicate an actual strong decline. In fact, much of the indicated decline is attributable to the lack of reporting by Member States using the new annual report questionnaire, which must be filled in online and thus may constitute a hurdle for some countries. Data identified as "2020 (estimated)" refer to likely overall quantities seized, based on the assumption that countries that did not report seizures for the year 2020 may have nevertheless registered seizures in 2020 in quantities similar to those in the previous year.

FIG. 49 Global quantities of pharmaceutical opioids seized, adjusted for purity and expressed in S-DDD, 2020



Sources: UNODC calculations based on responses to the annual report questionnaire; INCB, Narcotic Drugs: Estimated World Requirements for 2021 – Statistics for 2019 (E/INCB/2020/2); and INCB, Psychotropic Substances: Statistics for 2021 – Assessments of Annual Medical and Scientific Requirements (E/INCB/2020/3).

Note: S-DDD refers to "defined daily doses for statistical purposes" as defined by INCB. They are technical units of measurement for the purposes of statistical analysis and are not recommended daily prescription doses; actual doses may differ depending on treatments required and medical practices. Details of the S-DDD used for these calculations and of the purity adjustments made are provided in the methodological annex in the online version of the present report.

Tramadol, an opioid that is not under international control, accounted for 54 per cent of reported quantities of pharmaceutical opioids seized in the period 2016–2020, followed by codeine (38 per cent), mostly seized in the form of cough syrups, and fentanyl and its analogues (3 per cent).

Both the quantities of tramadol manufactured, and the quantities seized started to decline after the substance was put under improved national control in India in 2018.

Nonetheless, trafficking in tramadol did not disappear and partly shifted to the dark web. In 2020, authorities in India announced the first-time dismantling of a major international criminal network trafficking non-medical tramadol and other psychoactive substances on the dark web.[e] Similarly, a year later, intensified international cooperation helped to identify and interdict global trafficking in tramadol, as well as tapentadol, a newly emerging opioid analgesic that is also not under international control and that appears to have partly displaced tramadol in some markets.[f]

e The seizures were made under the INCB special intelligence operation named Operation Trance (see https://www.incb.org/incb/en/news/press-releases/2020/major-tramadol-trafficking-network-dismantled-under-incbs-operation-trance.html).

f In 2021, the INCB global Operational Partnerships to Interdict Opioids' Illicit Distribution and Sales (OPIOIDS) project coordinated Operation New Horizons, in which more than 160 officers from 90 agencies and international organizations worked

The overall breakdown of pharmaceutical opioids seized changes, however, once reported quantities are transformed into defined daily doses for statistical purposes (S-DDD),[g] suggesting that 90 per cent were related to various fentanyls in 2020.

Available data also indicate ongoing displacements among the more potent synthetic opioids, including among the fentanyl-related substances[23] and between the fentanyl-related substances and the non-fentanyl synthetic opioids, which have started to replace fentanyls in some instances.[24]

Global use of opioids

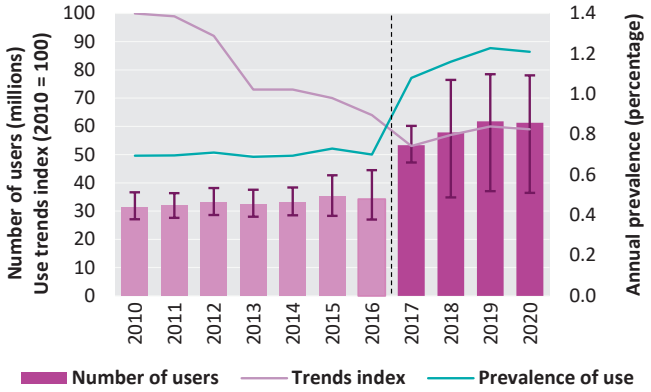
Opioid use remains high with a slight increase since 2017

Opioid use remains widespread. It is estimated that 61.3 million people (range: 36.5 million–78.1 million) had used opioids in the past year worldwide in 2020. This includes people who use opiates and people who use pharmaceutical opioids for non-medical purposes and corresponds to 1.2 per cent of the global population aged 15–64. The majority of people who use opioids are men – an estimated 85% based on data from 26 countries.

Since 2017, both quantitative and qualitative information have pointed to a moderate increase in opioid use, with possible stabilization in 2020. Qualitative reporting suggests that between 2010 and 2017 most countries observed decreases in opioid use. However, it is challenging to confirm long-term trends in opioid use by means of quantitative estimates, since it is not always possible to determine if changes were the result of actual phenomena or merely the result of improved data. For example, global estimates show a sharp increase in use between 2016 and 2017, but this mainly represents new estimates made available for Asia and Africa.

About half of the users of opioids had used opiates, mainly heroin and opium, in the past year. Opiate use includes, most often, the use of heroin and opium, but

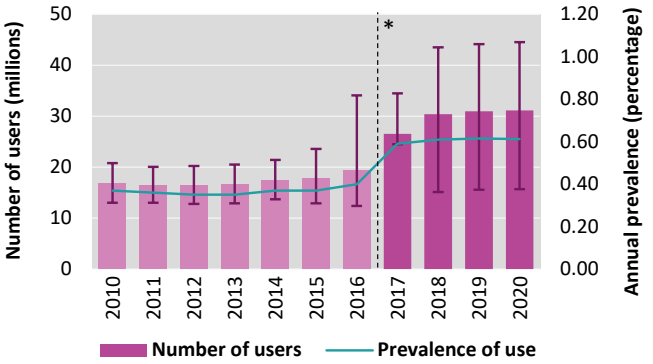
FIG. 50 Global use of opioids and reported trends in opioid use, 2010–2020



Source: UNODC, responses to the annual report questionnaire.

Note: After 2016, data on prevalence of use and numbers of users became available for two highly populated countries in Asia and Africa (India and Nigeria). This has led to significant improvement in the global estimates, but at the same time, limited comparability with estimates obtained previously. The opioid use trends index is based on qualitative information on trends in opioids use reported by Member States (on average, 52 countries per year in the period 2010–2020). The 'Trends index' is calculated on the basis of the number of countries reporting increases less the number of countries reporting decreases (2 points for "large increase", 1 point for "some increase", 0 points for "stable", -1 point for "some decrease", -2 points for "large decrease").

FIG. 51 Global use of opiates, 2010–2020



Source: UNODC, responses to the annual report questionnaire.

*Note: *After 2016, data on prevalence of use and numbers of users became available for two highly populated countries in Asia and Africa (India and Nigeria). This has led to significant improvement in the global estimates, but at the same time, limited comparability with estimates obtained previously.*

together to identify and interdict global trafficking in tramadol and tapentadol (see https://www.incb.org/incb/en/news/news_2021/incb-operation-new-horizons-identifies-new-trafficking-in-tapentadol--an-emerging-synthetic-opioid.html).

g S-DDDs refers to "defined daily doses for statistical purposes" as defined by INCB. S-DDDs are "technical units of measurement" for the purposes of statistical analysis and are not recommended daily prescription doses; actual doses may differ based on treatments required and medical practices. Details of S-DDDs used for these calculations are provided in the methodological annex of the present report.

also non medical use of codeine and morphine. Opiate use constitutes part of overall opioid use and follows similar trends.

Availability of pharmaceutical opioids for medical consumption

Decline after 2013 and stabilization in 2020

The availability of pharmaceutical opioids under international control for medical purposes[25] more than doubled in the period 2000–2010 before declining by 15 per cent between 2012 and 2019 and remaining basically stable in 2020. The overall decline after 2012 was primarily driven by declines in North America, where, starting in 2010, state and federal government agencies tightened prescribing policy guidelines and monitoring.[26]

The proportion of opiates among the available pharmaceutical opioids overall rose from 55 per cent in 2000 to 65 per cent in 2014 (mainly reflecting the growing importance of thebaine-based substances such as oxycodone), before declining to 61 per cent by 2020. The increase in recent years in the proportion of synthetic opioids for medical purposes is due to the fact that the decline in the availability of opiates has been more pronounced than the decline in the availability of synthetic opioids.

The largest quantities of pharmaceutical opioids available for medical consumption at the global level in 2020, expressed in S-DDD, were codeine (including preparations), followed by hydrocodone (including preparations) or, excluding preparations, hydrocodone, fentanyl, methadone, buprenorphine, oxycodone and morphine. Codeine accounted for more than two thirds of all preparations of such opioids, expressed in S-DDD, in 2020.[27] The decline in the availability of codeine preparations for medical consumption over the last five years (a decline of 30 per cent between 2016 and 2020), was, however, more pronounced than the overall decline in the availability of opioids, excluding preparations for medical consumption, over the same period (a decline of 10 per cent).[28]

The availability of methadone and buprenorphine, substances typically used in substitution treatment for heroin dependence, is trending upward, suggesting an increase in the delivery of agonist therapy for drug treatment globally. Worldwide, methadone was more widely available than buprenorphine, except in South Asia and, in very small quantities, in West and Central Africa.

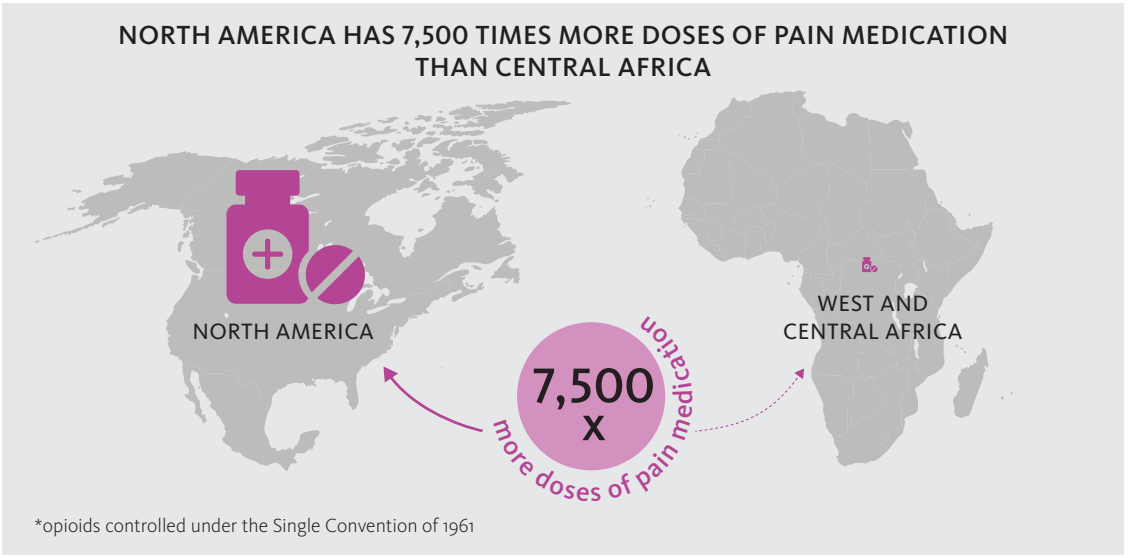
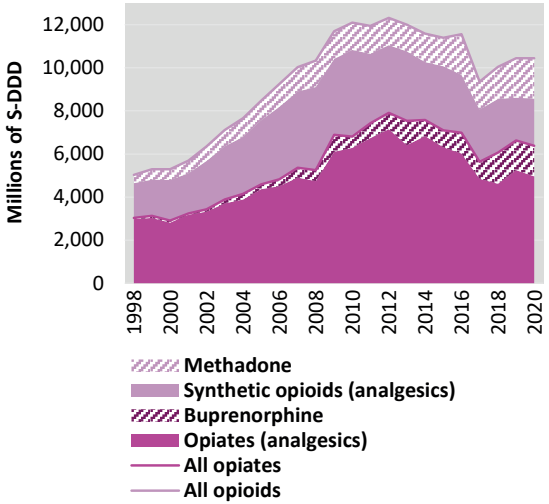


FIG. 52 Global amounts of pharmaceutical opioids under international control available for medical consumption (excluding preparations), 1998–2020



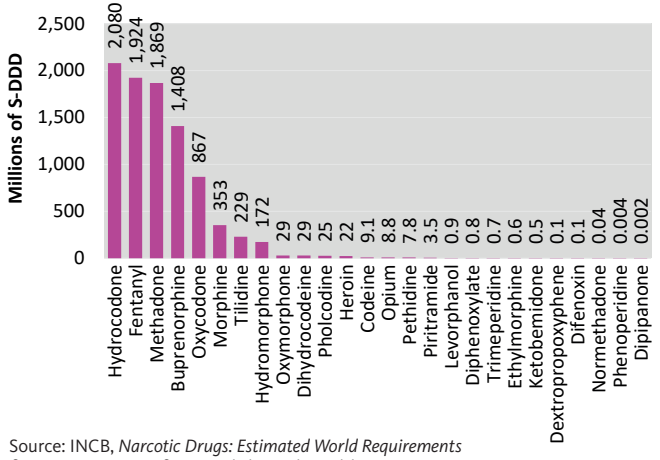
Source: INCB, *Narcotic Drugs: Estimated World Requirements for 2022 – Statistics for 2020* (E/INCB/2021/2).

Note: S-DDD refers to "defined daily doses for statistical purposes". As defined by INCB, S-DDD are "technical units of measurement" for the purposes of statistical analysis and are not recommended daily prescription doses; actual doses may differ depending on treatments required and medical practices. The statistics exclude preparations of opioids listed in Schedule III of the Single Convention on Narcotic Drugs of 1961 as amended by the 1972 Protocol. Details of S-DDD used for these calculations are provided in the methodological annex to the present report. The categories "opiates" and "synthetic opioids" include substances used as analgesics, excluding those used in opioid substitution treatment. Buprenorphine and methadone are substances used in opioid substitution treatment and as analgesics.

Availability of pharmaceutical opioids continues to be highly unequal across regions and subregions

The highest amounts available per capita of opioids under international control for medical purposes continued to be concentrated in North America, with Western and Central Europe, and Australia and New Zealand also above the global average. However, the discrepancy in availability compared with other regions continues to be extremely large, with the number of standardized doses of opioids controlled under the 1961 Single Convention available per 1 million inhabitants being about 7,500 times higher in North America than in West and Central Africa in 2020, a ratio similar to 2019. Including buprenorphine, controlled under Schedule III of the 1971 Convention on Psychotropic

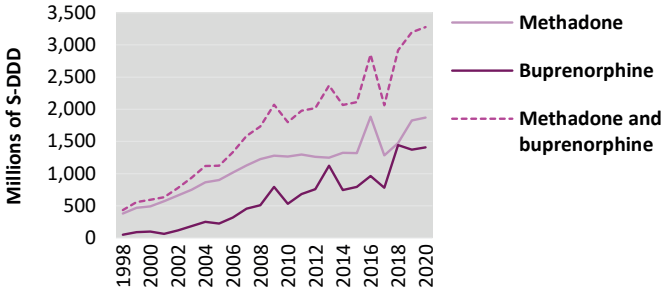
FIG. 53 Specific pharmaceutical opioids under international control available for medical consumption (excluding preparations), 2020



Source: INCB, *Narcotic Drugs: Estimated World Requirements for 2022 – Statistics for 2020* (E/INCB/2021/2).

Note: If including preparations, the amount of codeine available for consumption would have amounted to 2,148 million S-DDD (compared with 9.1 million S-DDD without preparations); codeine would thus have accounted for more than 17 per cent of all opioids available for medical consumption, slightly more than hydrocodone (16.5 per cent), in 2020.

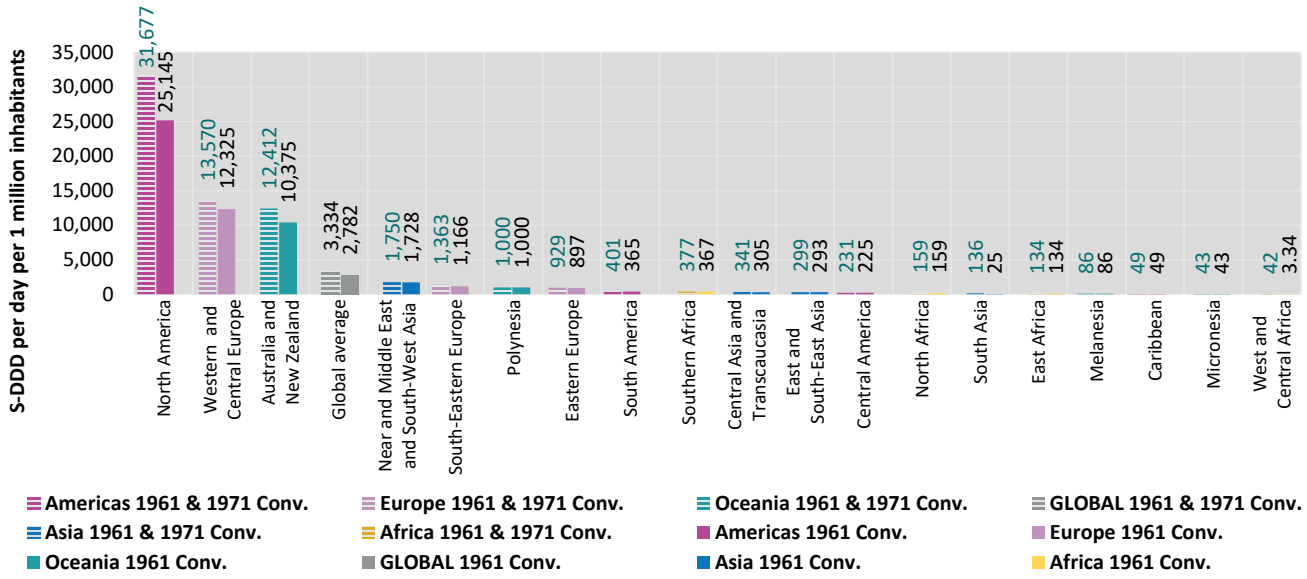
FIG. 54 Global amounts of methadone and buprenorphine available for medical consumption, 1998–2020



Source: INCB, Narcotic Drugs: Estimated World Requirements for 2022 – Statistics for 2020 (E/INCB/2021/2).

Substances, the number of standardized doses of controlled opioids were 755 times higher in North America than in West and Central Africa in 2020. Expressed in S-DDD, just 7 per cent of all internationally controlled (under the Conventions of 1961 and 1971) opioids were available for consumption in low- and middle-income countries, even though those countries accounted for 84 per cent of the world's total population.[29]

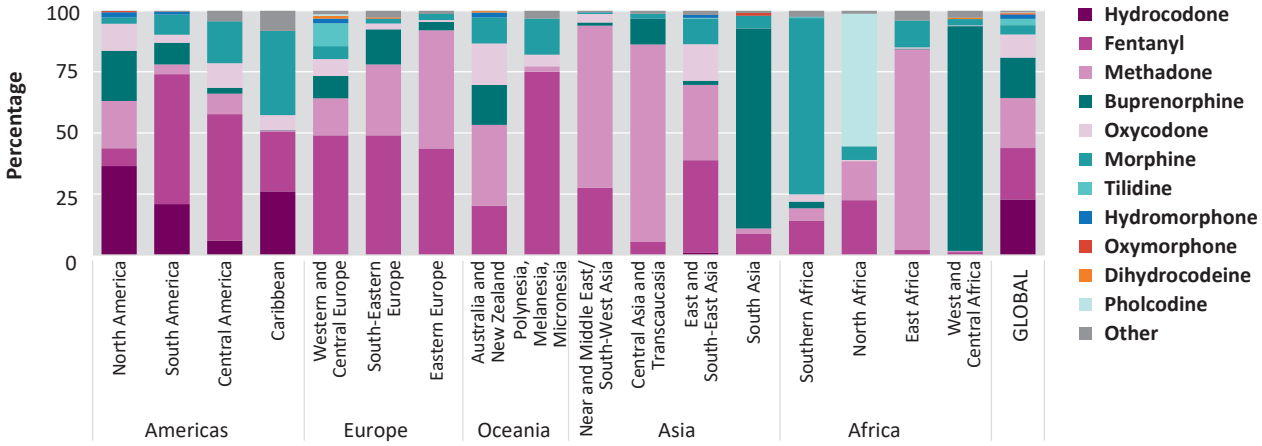
FIG. 55 Global amounts of opioids under international control (excluding preparations) available for medical consumption, by subregion, 2020



Sources: UNODC calculations based on the following INCB reports: Narcotic Drugs: Estimated World Requirements for 2022 – Statistics for 2020 (E/INCB/2021/2); and Psychotropic Substances: Statistics for 2020 – Assessments of Annual Medical and Scientific Requirements for Substances in Schedules II, III and IV of the Convention on Psychotropic Substance of 1971 (E/INCB/2021/3).

Note: Regions and subregions are those designated by UNODC in the World Drug Report; they may differ partly from those used by INCB in its publications.

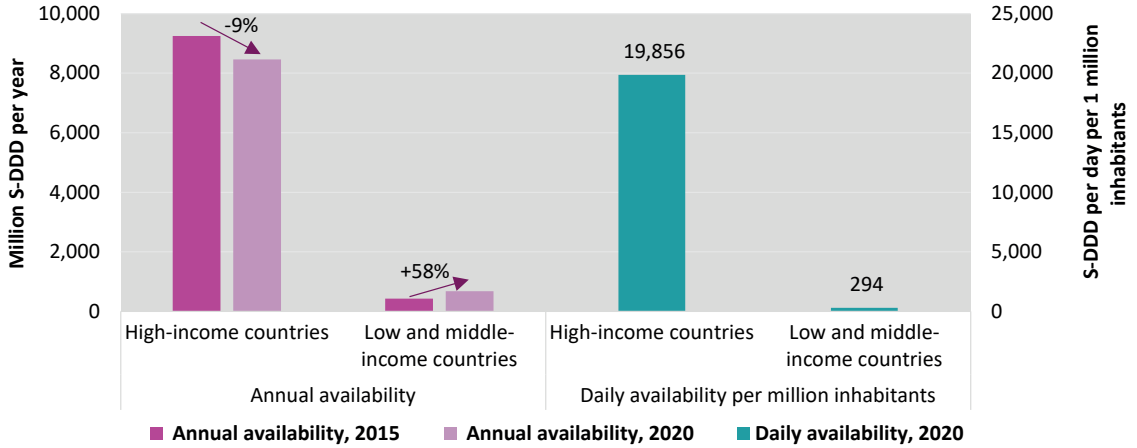
FIG. 56 Distribution of amounts of opioids under international control (excluding preparations) available for medical consumption, by substance and subregion, 2020



Sources: UNODC calculations based on the following INCB reports: Narcotic Drugs: Estimated World Requirements for 2022 – Statistics for 2020 (E/ INCB/2021/2); and Psychotropic Substances: Statistics for 2020 – Assessments of Annual Medical and Scientific Requirements for Substances in Schedules II, III and IV of the Convention on Psychotropic Substance of 1971 (E/INCB/2021/3).

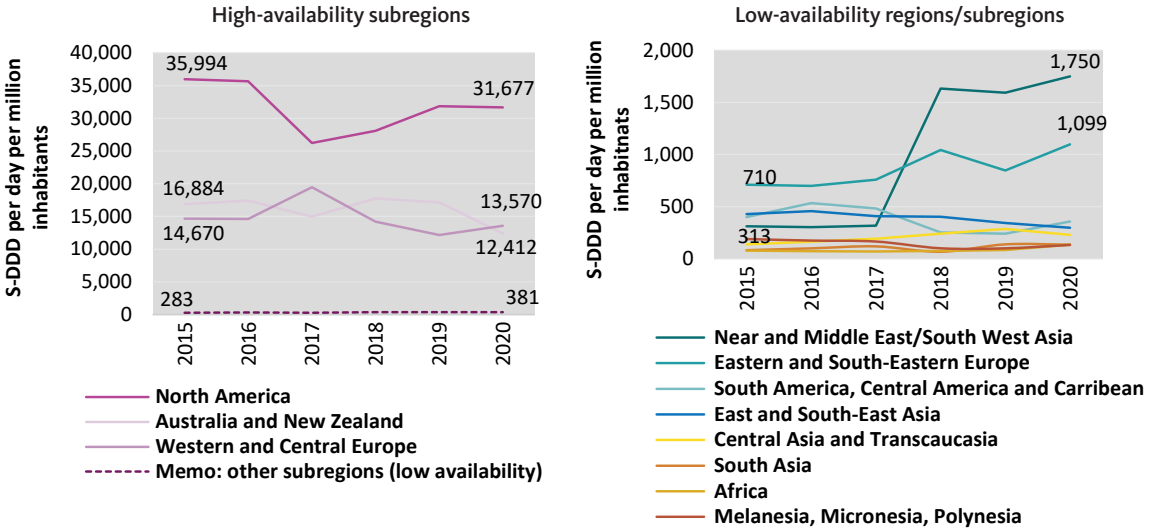
Notes: Regions and subregions are those designated by UNODC in the World Drug Report; they may differ partly from those used by INCB in its publications. Most of the codeine found in cough syrups is not included in these statistics, as such products are considered to be "preparations"; for that reason, codeine available for medical consumption is underrepresented in these statistics.

FIG. 57 Amount of opioids under international control (excluding preparations) available for medical consumption, by country income level group, 2015 and 2020



Sources: UNODC calculations based on the World Bank classification of countries by income levels and the following INCB reports: *Narcotic Drugs: Estimated World Requirements for 2022 – Statistics for 2020* (E/INCB/2021/2); and *Psychotropic Substances: Statistics for 2020 – Assessments of Annual Medical and Scientific Requirements for Substances in Schedules II, III and IV of the Convention on Psychotropic Substance of 1971* (E/INCB/2021/3).

FIG. 58 Trends in the availability of opioids under international control (excluding preparations) for medical consumption, by region and subregion, 2015–2020



Sources: UNODC calculations based on the following INCB reports: Narcotic Drugs: Estimated World Requirements for 2022 – Statistics for 2020 (E/INCB/2021/2), and previous years; and Psychotropic Substances: Statistics for 2020 – Assessments of Annual Medical and Scientific Requirements for Substances in Schedules II, III and IV of the Convention on Psychotropic Substance of 1971 (E/INCB/2021/3), and previous years.

Notes: Extrapolation techniques were used in cases where data were missing. "High-availability subregions" include subregions with per capita availability of opioids for medical purposes that is above the global average, i.e., North America, Western and Central Europe, and Australia and New Zealand. "Low-availability regions and subregions" include all regions and subregions with per capita availability of opioids for medical purposes that is below the global average, i.e. Africa, Asia, Eastern Europe, South-Eastern Europe, the Caribbean, Central America, South America, Melanesia, Micronesia and Polynesia.

Regional patterns and trends in opioid markets

Demand for opioids: regional analysis

Opioid use is a virtually universal phenomenon, with most users found in Asia and North America

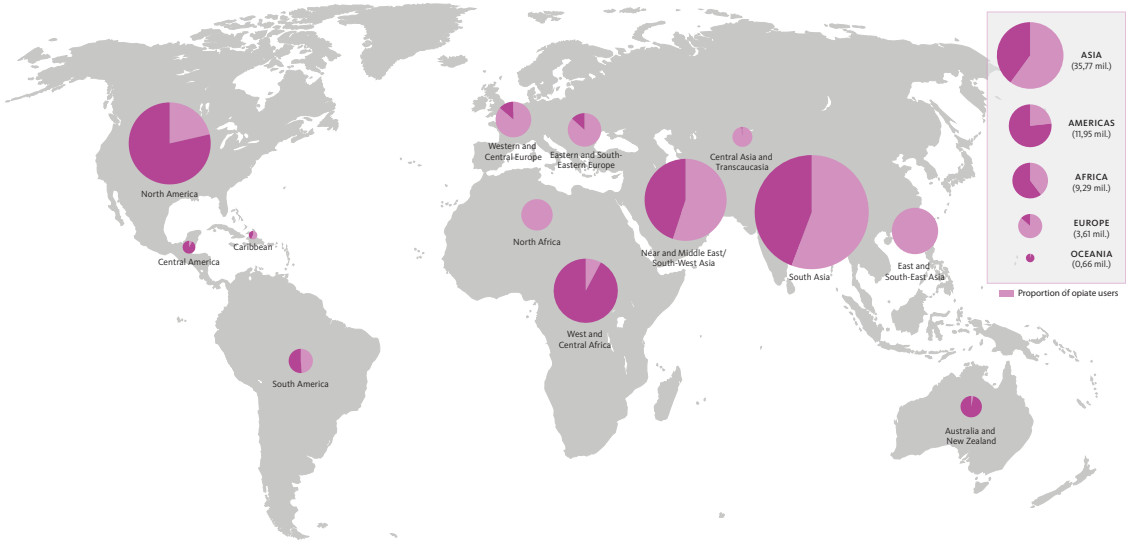
The non-medical use of opioids has been reported in every region and almost all countries. Prevalence levels are highest in North America, South-West Asia, Oceania, and South Asia. Owing to population size, the highest estimated number of opioid users live in South Asia, followed by North America.

As measured in terms of prevalence, the opioids reported by countries as the most used were heroin (in half (70) of the reporting countries), pharmaceutical opioids for non-medical use (in one quarter (35) of the reporting countries), opium (in 16 countries) and tramadol (in 11 countries).[30] Some other pharmaceutical opioids, such as codeine, buprenorphine and fentanyl, were mentioned by a small number of countries in a context of non-medical use. Furthermore, data on the most prevalent opioid in a country may mask significant pockets of users that use other opioids. For example, in Czechia, 1.5 per cent of the general population had used pharmaceutical opioids non-medically at least once in the past year, but heroin was the most used drug among those seeking treatment.[31]

There are currently two main dynamically evolving non-medical opioid use epidemics in the world, both driven by the relatively high availability of opioids produced at low cost. One is related to illicitly produced fentanyls, which have been mixed with heroin and other drugs in North America. The second affects North Africa, West Africa, the Near and Middle East and South-West Asia and concerns the non-medical use of tramadol.

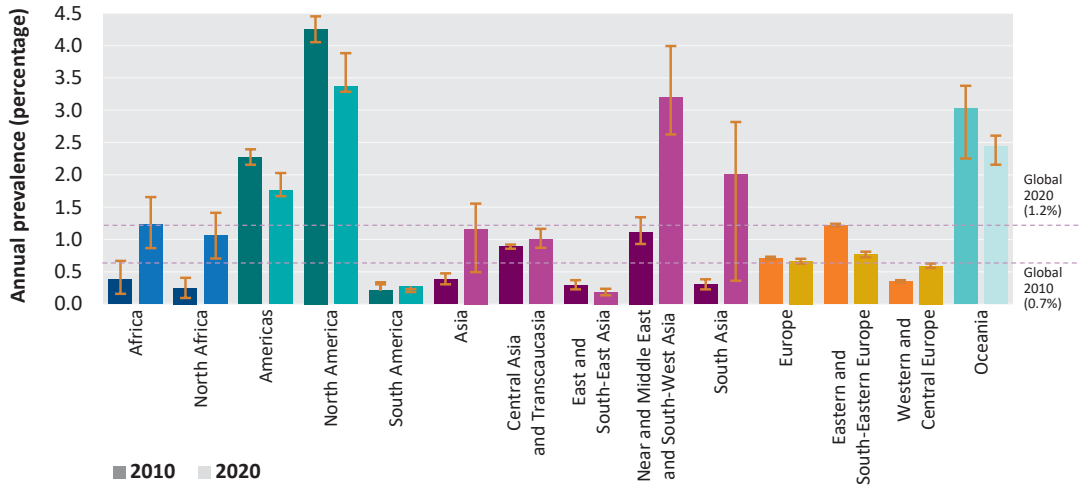
The opioid crisis in North America has not yet been associated with a sizeable increase in the number of opioid users, although this should be viewed within a context of very high prevalence of opioid use, but it has driven drug overdose mortality to unprecedent heights, owing in part to the high potency of fentanyl and its analogues. During the coronavirus disease (COVID-19) pandemic, the upward trend in overdose deaths has been further aggravated.

MAP 1 **Number of opioid users and proportion of opiate users thereof in regions and selected subregions, 2020**



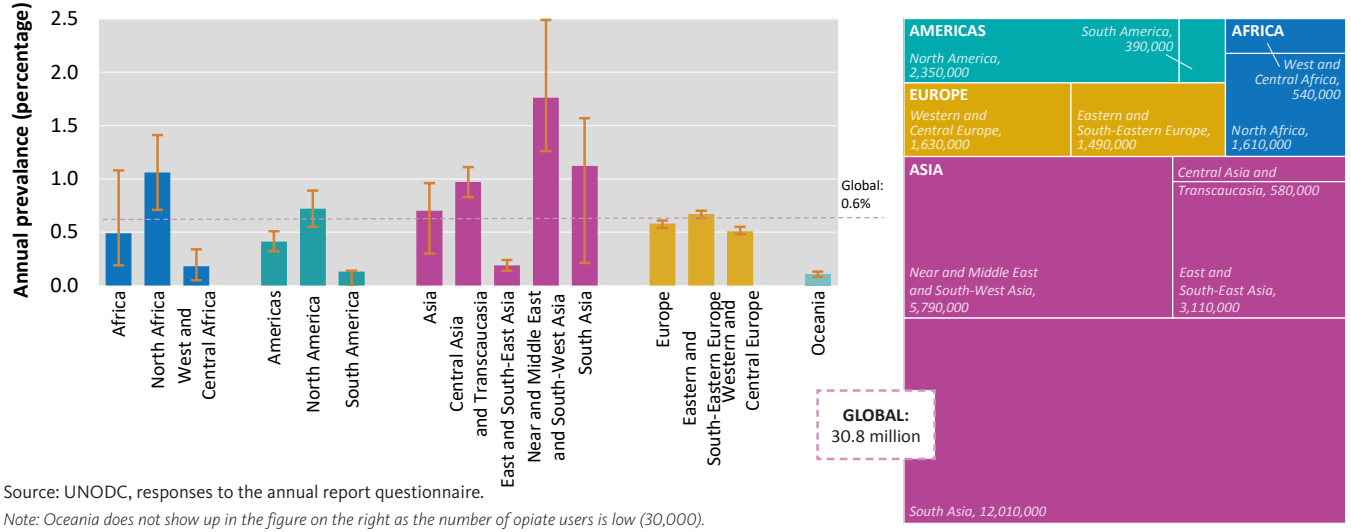
Source: UNODC, responses to the annual report questionnaire.

FIG. 59 Opioid use, by region and subregion, 2010 and 2020



Source: UNODC, responses to the annual report questionnaire.

FIG. 60 Prevalence of opiate use and number of people who use opiates, by region and subregion, 2020

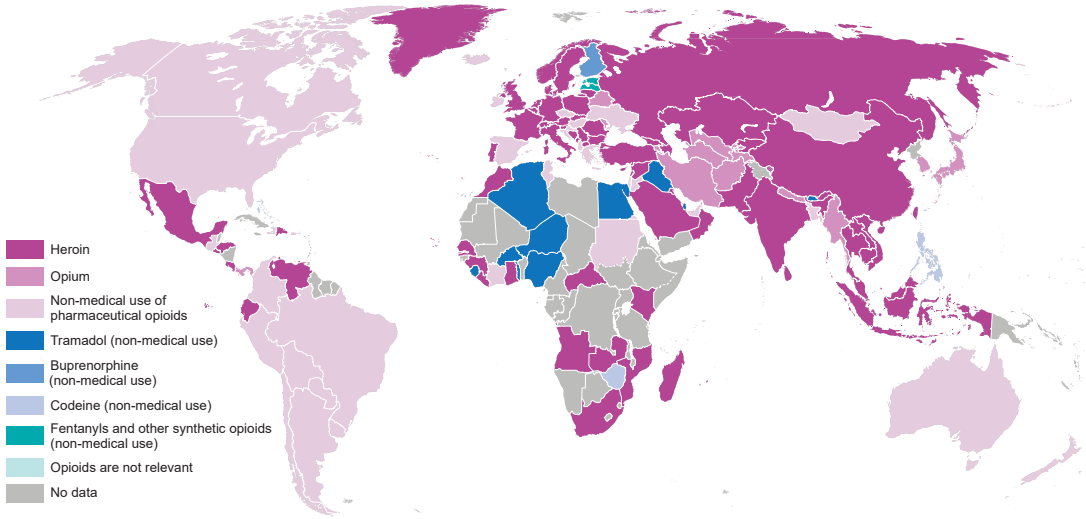


Source: UNODC, responses to the annual report questionnaire.

Note: Oceania does not show up in the figure on the right as the number of opiate users is low (30,000).

In Africa, the non-medical use of tramadol is likely spreading, as reflected in the increasing demand for treatment in some countries. It is not yet associated with a large number of overdose deaths, but it should be noted that no systematic monitoring of drug-related deaths exists in most of the affected countries. However, even if deaths related to tramadol overdose do occur, as evidenced in other regions such as Europe,[32] mortality rates associated with tramadol can be expected to be lower than those associated with fentanyls, owing to the dramatically different potencies of the two substances.

MAP 2 Opioids most used for non-medical purposes, by country, 2020



Source: UNODC, responses to the annual report questionnaire.

Note: The information is based primarily on the ranking of prevalence of non-medical opioid use confirmed by reported prevalence of non-medical opioid use and, when that was not available, on the ranking or data on treatment of non-medical opioid use reported in the annual report questionnaire. Estimating prevalence on the basis of drug treatment data has its limits, particularly with regard to the non-medical use of drugs such as pharmaceutical opioids, which does not carry the same level of social stigma as that of other drugs and for which users may be less likely to seek treatment.

The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations. Dashed lines represent undetermined boundaries. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. The final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined. A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

There likely exist other dynamically evolving non-medical opioid use crises, for example, the misuse of codeine or codeine-based preparations in a number of countries, such as the Bahamas, Bangladesh, Bhutan, Nigeria, the Philippines, South Africa and Zimbabwe,[33, 34] but data are scarcer in this regard.

Supply of opioids: regional analysis

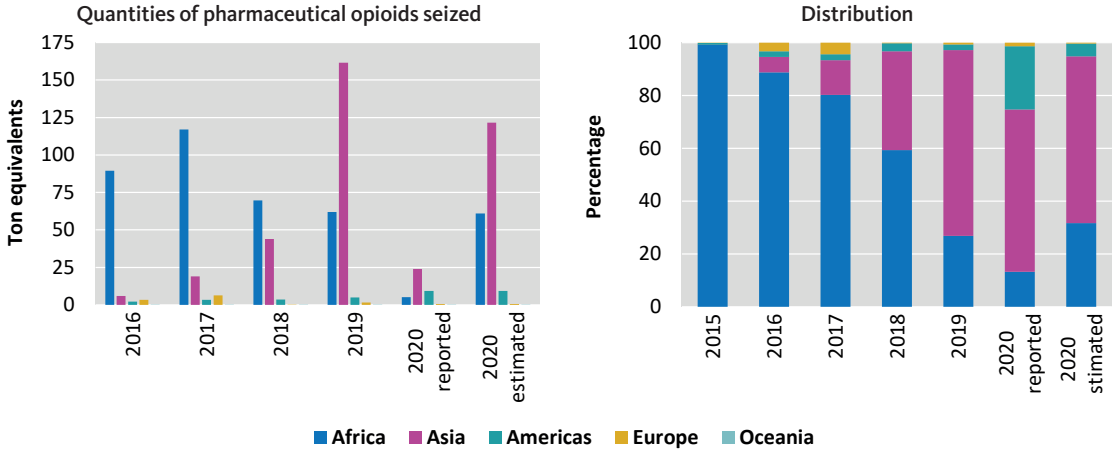
Africa leads in seizures of pharmaceutical opioids; seizures in Asia and North America are also notable

Africa reported the largest quantities of pharmaceutical opioids seized between 2016 and 2020, accounting for 54 per cent of global quantities seized (in kilogram equivalents), mainly reflecting seizures of tramadol. However, the proportion of global seizures of pharmaceutical opioids effected in Africa clearly decreased during that period. This contrasts with Asia, which saw a marked increase. The main pharmaceutical opioid seized in Asia was codeine. If quantities of pharmaceutical opioids seized were adjusted for purity and converted into S-DDD, most of the global seizures of pharmaceutical opioids in recent years would be attributable to North America, reflecting the large-scale seizures of fentanyl and its analogues in the subregion.

Seizures of opiates remain concentrated in Asia

In 2020, most of the heroin and morphine seized globally was once again seized in Asia, with the amount seized increasing by about 46 per cent compared with the previous year. Figures were boosted by an increase in quantities seized of more than 60 per cent in South-West Asia. In that connection, that subregion, as well as the broader subregion also comprising the Near and

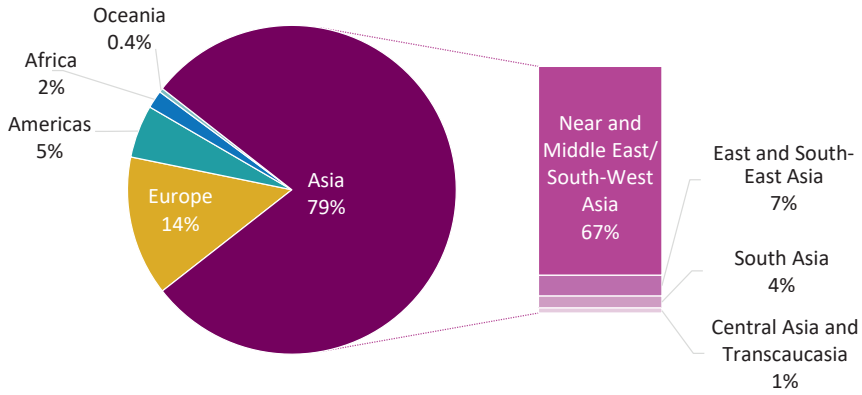
FIG. 61 Global quantities of pharmaceutical opioids seized and geographical distribution, 2016–2020



Source: UNODC, responses to the annual report questionnaire.

Notes: The data refer to seizures of opioids reported by Member States to UNODC in the former version of the annual report questionnaire, under the category "pharmaceutical opioids". For the new version of the annual report questionnaire, the following categories were used as proxies: seizures of buprenorphine, codeine, desomorphine, fentanyl and its analogues, methadone, oxycodone and tramadol, as well as the general category of pharmaceutical opioids. Data on seizures for 2020 reported by Member States to UNODC for 2020 showed a significant decline, which, however, does not necessarily indicate an actual decline. In fact, much of the indicated decline is attributable to the lack of reporting by Member States using the new annual report questionnaire, which must be filled in online and thus may constitute a hurdle for some countries. Data identified as "2020 (estimated)" refer to likely overall quantities seized, based on the assumption that countries that did not report seizures for the year 2020 may have nevertheless registered seizures in 2020 in quantities similar to those in the previous year.

FIG. 62 Geographical distribution of global quantities of heroin and morphine seized, 2020



Source: UNODC, responses to the annual report questionnaire.

Note: A total of 160 tons of heroin and morphine were seized in 2020.

Middle East, saw its proportion of global seizures of opiates increase from 50 per cent in 2019 to 67 per cent in 2020 and from 77 per cent to 85 per cent within Asia, with the increase driven by seizures reported by the Islamic Republic of Iran and Pakistan.

Other regions reporting an increase in seizures of heroin and morphine were South-Asia and Oceania, but most saw a decline in 2020, including all the sub-regions of Europe, the Americas and Africa.

Regional distribution of morphine and heroin manufacture

Between 2013 and 2019, the average annual potential manufacture of heroin at the global level, adjusted to a typical export purity of heroin of 50 to 70 per cent and based on estimates derived from opium production figures, is estimated to have been approximately 550 tons per year.[i]

Whereas quantities of opium produced are estimated scientifically using satellite imagery and are confirmed by a "ground truthing" exercise and yield estimates based on the number and size of poppy bulbs found in poppy fields, the estimation of actual heroin manufacture is less robust and no reliable methods exist for identifying the actual locations of manufacture. However, some readily available indicators offer possibilities for estimating the likely importance of specific regions in the manufacture of morphine and heroin, at least tentatively.

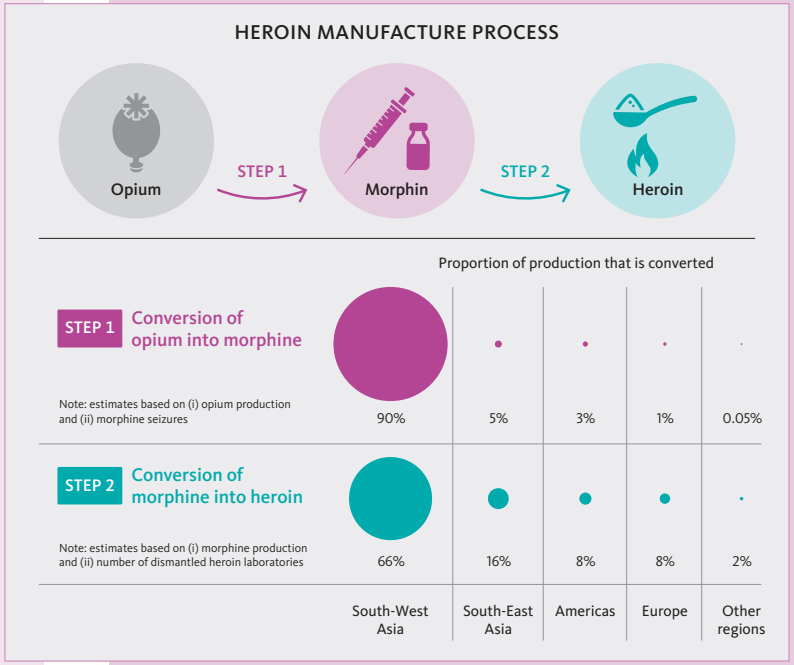
This process can vary, but in broad terms, it starts with identifying the locations where the stages of manufacture take place. In the first stage, opium is transformed into morphine, and in the second stage, morphine is transformed into heroin. These stages can, and often do, take place in different countries. The distribution of opium production, in combination with seizures of morphine, suggests that most of the first stage of heroin manufacture – the transformation of opium into morphine – takes place close to where opium is produced. In the period 2013–2019, the bulk of morphine manufacture took place in South-West Asia (ranging from 83 per cent of total manufacture, based on opium production estimates, to 98 per cent, based on seizures of morphine, although this last upper limit likely reflects a low rate of morphine interception in other regions rather than evidence of a manufacturing location), followed by South-East Asia and the Americas.

The location where the second stage, converting morphine into heroin, takes place can be estimated on the basis of (a) seizures of morphine, as an indicator of the extent of morphine availability, and (b) the number of detected heroin laboratories. The estimates derived in this way suggest that most processing of morphine into heroin still takes place close to opium production locations, that is, mainly in South-West Asia, followed by South-East Asia, but with some processing also taking place along principal heroin trafficking routes and a less significant level of processing taking place in consumer countries.

The heroin is frequently mixed with cutting agents along trafficking routes and in destination countries.

Nonetheless, there are caveats that need to be considered when using these indicators. It should be noted that estimates of the geographical distribution of morphine and heroin manufacture depend on the quality of the indicators used and their relevance in describing the level and location of manufacture. Seizures of morphine, for example, may be more reflective of law enforcement capacities and priorities than the level of supply. The same is true of the dismantling of heroin laboratories. In addition, the size of dismantled laboratories can differ and may distort the regional distribution of manufacturing. Moreover, the definition of what constitutes a heroin laboratory in the data reported by Member States is extremely broad and includes not only heroin manufacturing laboratories as such, but also facilities where heroin is diluted and cut with other products, facilities where heroin is packaged, places where chemicals used in heroin manufacture are stored, and dumping sites. This may inflate the number of reported laboratories and the extent of manufacture, notably in consumer regions. Finally, reporting of these indicators is uneven across countries and regions, creating an additional bias. Seizures of morphine also strongly fluctuate from year to year but may nevertheless help to provide reasonable estimates over time.

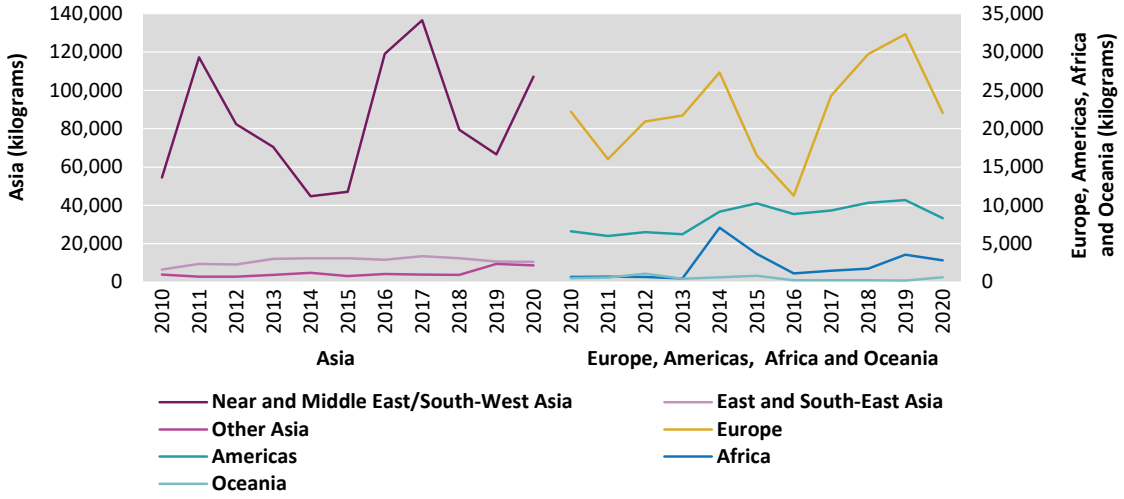
However, while each indicator has its shortfalls and biases, and precise percentages of regional manufacturing cannot be calculated, triangulating their information may still provide a reasonably accurate picture.



Sources: UNODC, opium production estimates based on UNODC, World Drug Report 2021; and UNODC, estimates of seizures of morphine and of dismantled heroin laboratories based on responses to the annual report questionnaire.

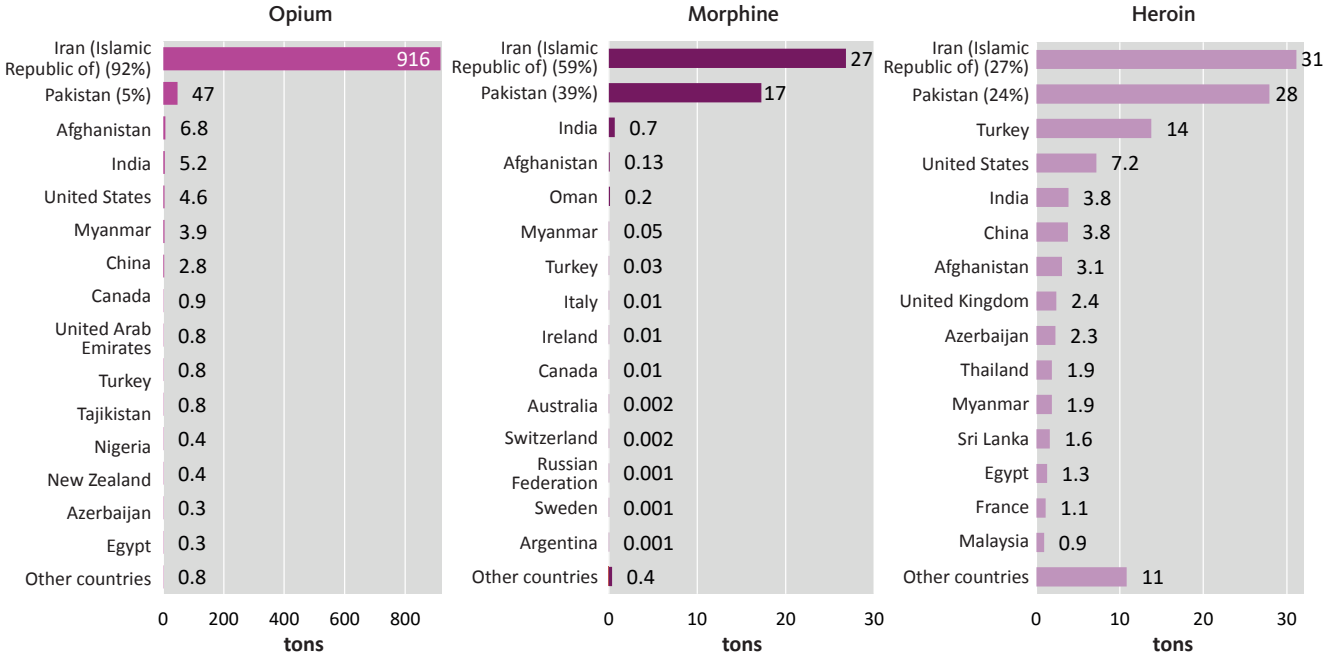
[i] UNODC, World Drug Report 2021, Booklet 3, Drug Market Trends: Opioids, Cannabis (United Nations publication, 2021).

FIG. 63 Heroin and morphine seized, by region, 2010–2020



Source: UNODC, responses to the annual report questionnaire

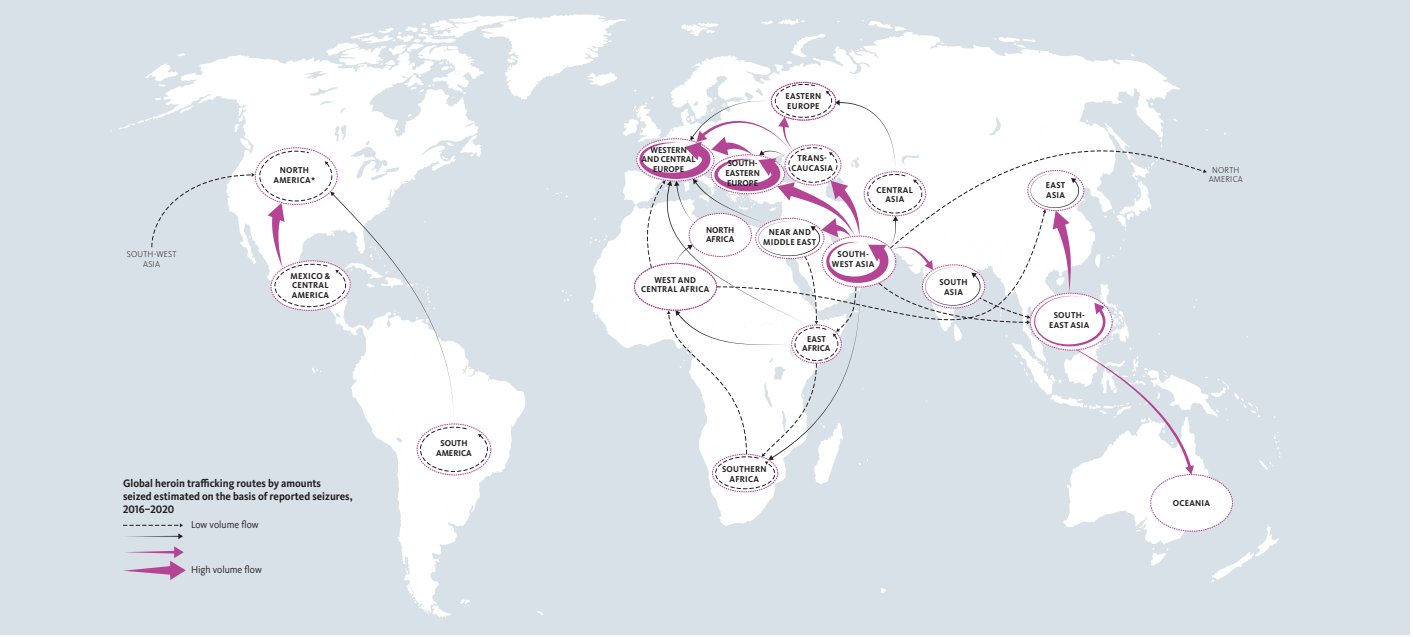
FIG. 64 Countries reporting the largest quantities of opiates seized, 2020



Source: UNODC, responses to annual report questionnaire.

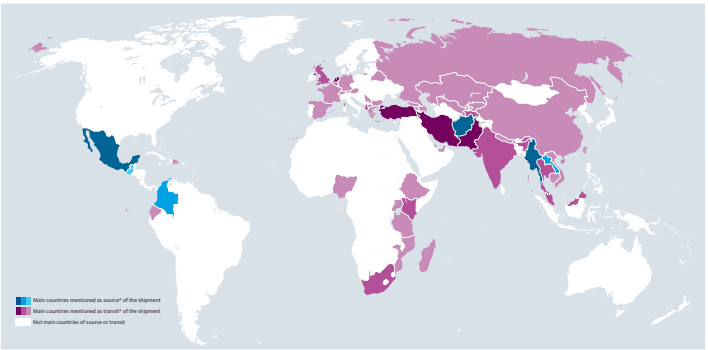
Note: the percentages refer to the share of the country out of the total seizures of the drug.

MAP 3 Main opiate trafficking flows, 2016–2020



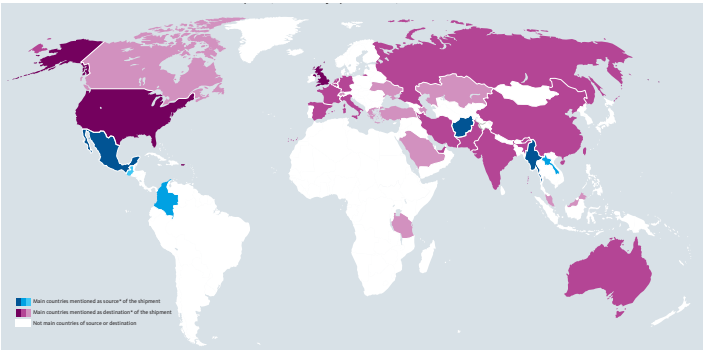
*Note: The size of the route is based on the total amount seized on that route, according to the information on trafficking routes provided by Member States in the annual report questionnaire, individual drug seizures and other official documents, over the period 2016–2020. The routes are determined on the basis of reported country of departure/transit and destination in these sources. As such, they need to be considered as broadly indicative of existing trafficking routes while several secondary routes may not be reflected. Route arrows represent the direction of trafficking: origins of the arrows indicate either the area of departure or the one of last provenance, end points of arrows indicate either the area of consumption or the one of next destination of trafficking. Therefore, the trafficking origin may not reflect the country in which the substance was produced. * North America excluding Mexico.*

MAP 4 Main countries identified as source and transit of heroin shipments, as described by reported seizures, 2016–2020



** A darker shade indicates a larger amount of heroin being seized with the country as source/destination of the shipment, according to the information on trafficking routes provided by Member States in the annual report questionnaire, individual drug seizures and other official documents, over the 2016–2020 period. The source may not reflect the country in which the substance was produced. The main countries mentioned as source or transit were identified on the basis of both the number of times they were identified by other Member States as departure/transit of seizures, and the annual average amount that these seizures represent during the 2016–2020 period. For more details on the criteria used, please see the Methodology section of this document.*

MAP 5 Main countries identified as source and destination of heroin shipments, as described by reported seizures, 2016–2020



** A darker shade indicates a larger amount of heroin being seized with the country as source/destination of the shipment, according to the information on trafficking routes provided by Member States in the annual report questionnaire, individual drug seizures and other official documents, over the 2016–2020 period. The source may not reflect the country in which the substance was produced. The main countries mentioned as source or destination were identified on the basis of both the number of times they were identified by other Member States as departure/transit or destination of seizures, and the annual average amount that these seizures represent during the 2016–2020 period. For more details on the criteria used, please see the Methodology section of this document.*

Source: UNODC, elaboration based on responses to the annual report questionnaire.

Note: See the online methodological annex to the present report for more details.

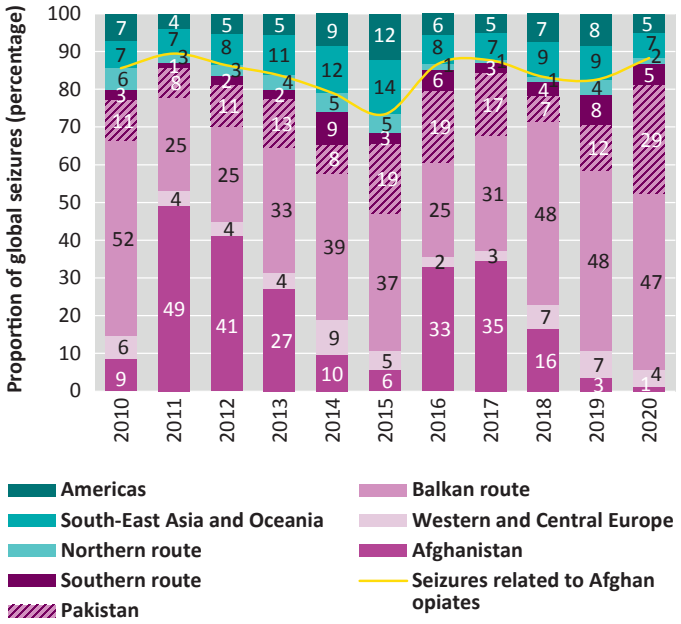
The boundaries and names shown and the designations used on these maps do not imply official endorsement or acceptance by the United Nations. A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas). The dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

The Balkan route remains the main opiate trafficking channel

According to seizure data, the world's most important heroin and morphine trafficking route continues to run from Afghanistan through the Islamic Republic of Iran to Turkey, and then onward through the Balkan countries to Western and Central Europe, with about half of all seizures of heroin and morphine worldwide made in countries along this so-called "Balkan route".

There were significant changes in 2020. Seizures of heroin and morphine increased significantly in countries neighbouring Afghanistan, notably in the Islamic Republic of Iran and Pakistan, but declined in the Balkan countries and in destination countries in Western and Central Europe.

FIG. 65 **Distribution of quantities of heroin and morphine seized, by main trafficking routes, 2010–2020**



Source: UNODC, responses to the annual report questionnaire.

Note: The Balkan route includes the Islamic Republic of Iran, half of Transcaucasia, and South-Eastern Europe; the southern route includes South Asia, Gulf countries and other countries in the Near and Middle East and Africa; and the northern route includes Central Asia, Eastern Europe and half of Transcaucasia. Heroin seized in Transcaucasia was attributed partly to the Balkan route and partly to the northern route, as it may supply both routes

The principal immediate outlet for opiates produced in Afghanistan seems to be Pakistan, with seizures reported there accounting for close to 29 per cent of all heroin and morphine seized globally in 2020. Some seizures were destined for domestic consumption, some for trafficking to the Islamic Republic of Iran and beyond, and some for trafficking along the southern route[h] to either South Asia (4 per cent of global seizures), notably India, or to eastern Africa (1 per cent). Another important route, accounting for about 2 per cent of global seizures of heroin and morphine in 2020, runs from South-West Asia to Central Asia and Transcaucasia and onward to the Russian Federation or Western and Central Europe.

For opiates originating in South-East Asia, mainly Myanmar, the main routes run to East Asia, elsewhere in South-East Asia, and Oceania, which together account for 7 per cent of global seizures of heroin and morphine. Routes in the Americas flow from south to north, mainly to the United States, either from Mexico or, to a lesser extent, from South America, notably Colombia, with these two routes accounting for a combined 5 per cent of global seizures in 2020.

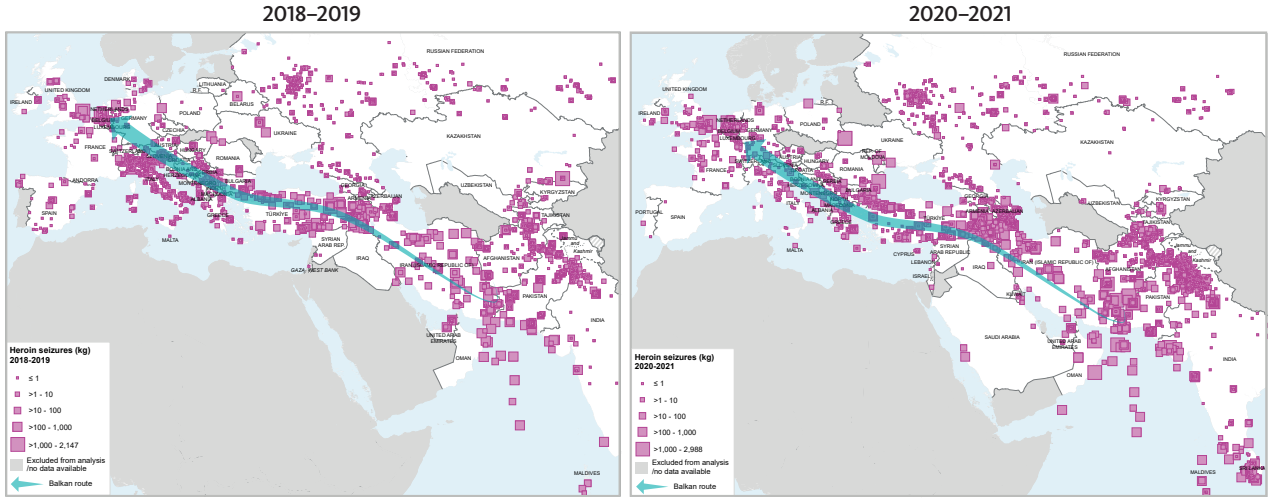
COVID-19 pandemic has not changed overall trafficking patterns but has had an impact on heroin flows

While the COVID-19 pandemic has not changed the Balkan route's status as the most prominent heroin trafficking corridor, it did have an impact on trafficking activities during 2020, before they rebounded in 2021.

Some traffickers apparently tried to circumvent the Balkan route to ship heroin during the pandemic, shifting flows towards the southern route. This was reflected by the growing number of large seizures of heroin of up to 1.3 tons on the Arabian Sea since the onset of the pandemic and the similarly large seizures made on ships arriving from Western Asia at a number of European ports, such as in the United Kingdom, which was an exception in Western Europe in reporting a marked increase in major seizures in 2020, mainly sourced directly from South-West Asia.

h The southern route includes trafficking from South-West Asia, notably Pakistan, to South Asia, the Gulf countries, and other countries in the Near and Middle East and Africa.

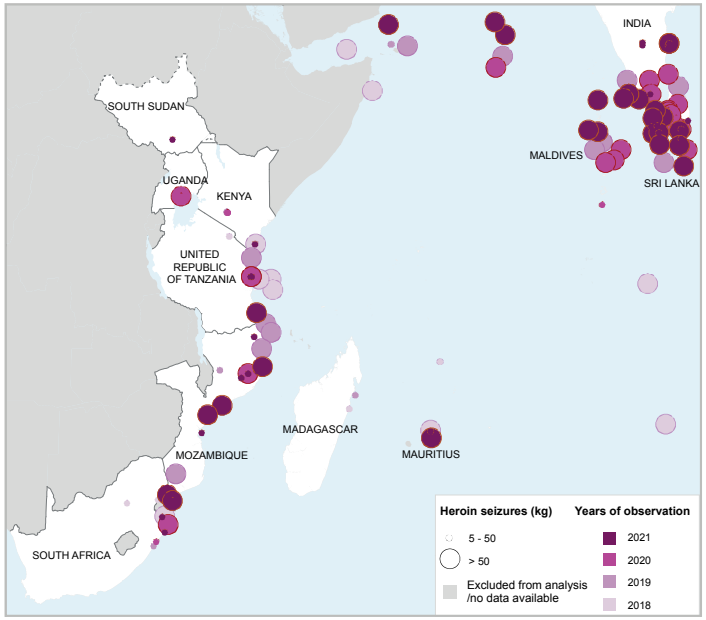
MAP 6 Significant individual seizures of heroin along the Balkan route, 2018–2019 and 2020–2021



Source: UNODC, Drugs Monitoring Platform.

The boundaries and names shown and the designations used on these maps do not imply official endorsement or acceptance by the United Nations. The dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

MAP 7 Significant individual seizures of heroin in East and South-East Africa, 2018–2021



Source: UNODC, UNODC Drugs Monitoring Platform Brief: Latest patterns and trends in trafficking routes of heroin and methamphetamine originating in Afghanistan, May 2022.

The boundaries and names shown and the designations used on these maps do not imply official endorsement or acceptance by the United Nations. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined.

Basic patterns of trafficking of heroin to Africa have remained unchanged, with most shipments arriving on the eastern coast for onward trafficking. Based on data provided by African countries using the UNODC annual report questionnaire and on individual drug seizures recorded in the UNODC Drugs Monitoring Platform, overall seizures of heroin reported by countries in Africa showed a year-on-year decline in 2020, but this trend appears to have been reversed in 2021.

Patterns and trends in specific subregions

South-West Asia

Relatively high prevalence of opiate use, with a wide gender gap and pronounced rates of use in rural areas

The level of opioid use in the three countries comprising South-West Asia is estimated to be well above the global average, with past-year use prevalence levels at almost 3.3 per cent of the adult population aged 15–64 in 2020, or an estimated 7 million users, representing an increase from the 1.1 per cent prevalence estimated for the region in 2010. It is likely that the prevalence of the use of opioids may be even higher than estimated from studies based on self-reporting. For example, in a study of industrial workers in the Islamic Republic of Iran, 3.8 per cent reported that they had used an opioid in the past 30 days, but 14.4 per cent had provided a urine sample that had tested positive for opioids.[35] As a subset of opioid use, the prevalence of opiate use in the region is also estimated to be higher than the global average, at approximately 1.8 per cent in the past year, with opium being the predominant opiate used in Afghanistan and the Islamic Republic of Iran, and heroin the predominant opiate used in Pakistan.[36] Evidence of the use of other opioids in the region includes the non-medical use of codeine, tramadol and diverted methadone.

The prevalence of opium use was estimated at 1.5 per cent among the general population of the Islamic Republic of Iran in 2013,[37] with higher levels among some population groups, such as students (4 per cent in 2017).[38] Furthermore, the popularity of opium has been reported as declining among Iranian youth over the past 30 years.[39] Recent opium use among Afghan adults (aged 15+) was estimated to range between 0.5 and 5.7 per cent[40] and past-year prevalence was at 2 per cent among high school students aged 15-18 years in the country in 2018.[41]

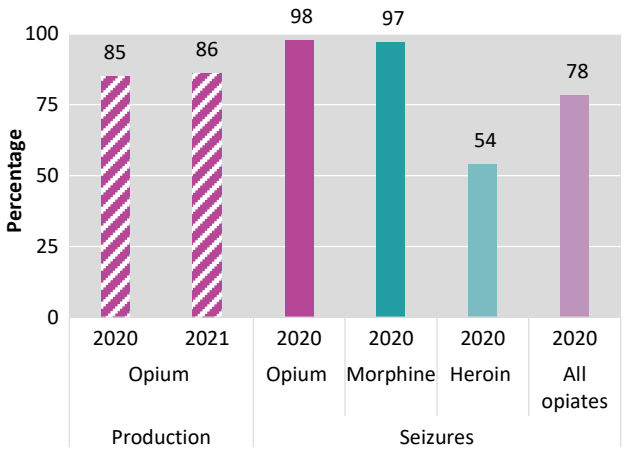
The gender gap in drug use in the region is wider than the gap at global level. For example, a study in the Islamic Republic of Iran estimated the prevalence of opium use among males to be about 13 times higher than among females,[42] more than double the global average of 5-6 times. The prevalence of opioid use tends to be highest in rural areas of Afghanistan and in some provinces of the Islamic Republic of Iran. For example, opioid use was detected in 10.1 per cent of the rural population in Afghanistan, three times more than in the population of urban areas, in contrast to the situation in other regions.[43]

South-West Asia continues to dominate the global supply of opiates

South-West Asia accounted for most of the opium produced in the 1990s and has continued to do so since 2002, leading to extremely high levels of trafficking in and seizures of opiates. More than three quarters of all opiates seized worldwide (expressed in heroin equivalents) in 2020 were seized in South-West Asia.

Afghanistan continues to be the world's largest opium producer by a substantial margin, with the epicentre

FIG. 66 **Proportion of South-West Asia in global opium production and global opiate seizures**



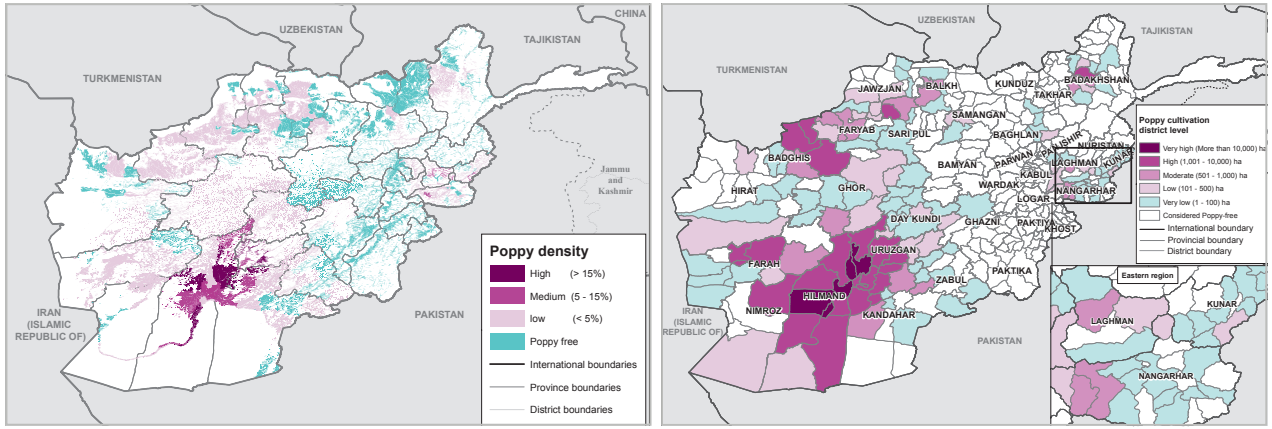
Source: UNODC, responses to the annual report questionnaire.

Note: the percentage of all opiates is calculated on the basis of weights in heroin equivalents.

MAP 8 Opium poppy cultivation in Afghanistan, 2021

Density of opium poppy cultivation in agricultural land, expressed as the proportion of agricultural land used for opium poppy cultivation2020–2021

Extent of opium poppy cultivation in terms of hectares under cultivation, by district



Source: UNODC, "Drug situation in Afghanistan 2021: latest findings and emerging threats" (November 2021).

The boundaries and names shown and the designations used on these maps do not imply official endorsement or acceptance by the United Nations. The dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

of opium poppy production being Helmand province, on the border with Pakistan. Approximately half of all of the opium poppy production in Afghanistan takes place in Helmand province,[44] where 20 per cent of all agricultural land is dedicated to the crop.[45]

What next in Afghanistan? Three potential scenarios following the Taliban's return to power

Given that Afghanistan accounted for about 86 per cent of global illicit opium production in 2021, any sudden changes in production in the country would have a major impact on the global supply of opiates.

The Taliban's return to power in August 2021 has led to major transformations in Afghanistan, affecting the rule of law, security and socioeconomic development, phenomena that are closely linked with drug production,[46] thus creating at least three opposing scenarios for the potential development of opium production in the country.

Scenario 1: an expansion of opium production

The first scenario foresees a combination of decreased socioeconomic development and gaps in government resources and skills to control drug production and trafficking (with or without the political will to combat drug-related crime), leading to a drastic or gradual but significant increase in opium production.

How likely is the scenario?

The erosion of socioeconomic development is already visible and Afghanistan has been facing serious economic problems, notably the threat of large-scale famine. A report published by the Food and Agriculture Organization of the United Nations in October 2021 warned that the number of people facing acute food insecurity in Afghanistan had increased to 22.8 million, or 55 per cent the country's population, during the winter season (the period from November 2021 to March 2022), a consequence of: (a) conflict, which in 2021 added 700,000 people to the 3.5 million Afghans already displaced; (b) severe drought, which affected 25 of the 34 provinces between October 2020 and May 2021; and (c) overall economic decline linked to the freezing of $9.5 billion worth of national assets abroad, devaluation of the national currency, high food prices and mass unemployment.[47] These are substantial

challenges for a country already operating at bare minimum.

The situation has been further aggravated by the fact that development assistance has been largely halted. Until the change in government in August 2021, development assistance was equivalent to 22 per cent of gross domestic product (GDP)[48] and for two decades helped to fund education, health care, governance reform and infrastructure, including schools, hospitals, roads, dams and essential infrastructure projects.[49] Without such assistance, GDP will fall substantially and the relative importance of the opiate sector for the country's overall economy will thus further increase.

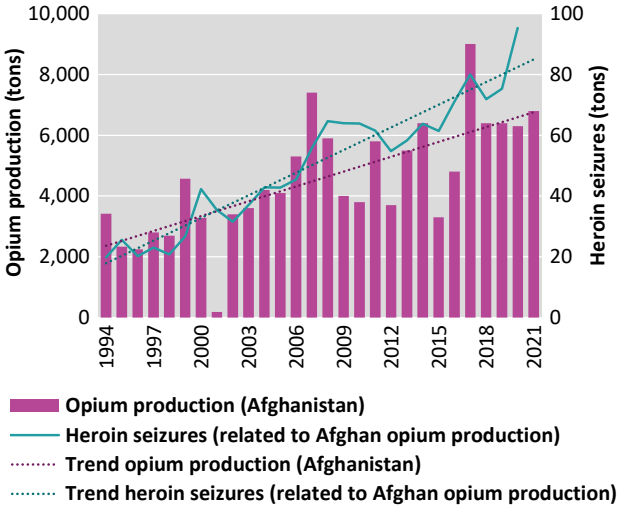
The extent of the political will and the capacity to drastically reduce opium production and the resources available to do so remains uncertain. In August 2021, the Taliban announced to the media an opium ban,[50] and in April 2022 issued a decree banning all drugs (see below for more details),[51] but the impact of this decree remains unclear. Several weeks after the first media announcement against drugs, the Taliban expressed to the media some level of tolerance, at least temporarily, towards opium cultivation as a way to overcome economic hardship.[52, 53]

Under the current socioeconomic conditions, there is a definite possibility that in 2022 there will be a large increase in production, initiating a significant expansion of the global opiate supply, if other conditions remain unchanged. But the likelihood of a long-term expansion is not only linked to the fate of the socioeconomic conditions and governance in Afghanistan but also to the possibility of expanding the global opiate market currently fed by opiates originating in Afghanistan. The decreasing and relatively low price of opium in Afghanistan before the change in government suggests that the high level of production in recent years had fully met the demand of the global opiate market, such that there may not be much space for a further expansion of the market, unless new destination markets are found.

Possible impact of the scenario

Conclusions on the possible consequences of a scenario of growing opium production in Afghanistan can be drawn from the dynamics observed in opiate markets during the last two decades.

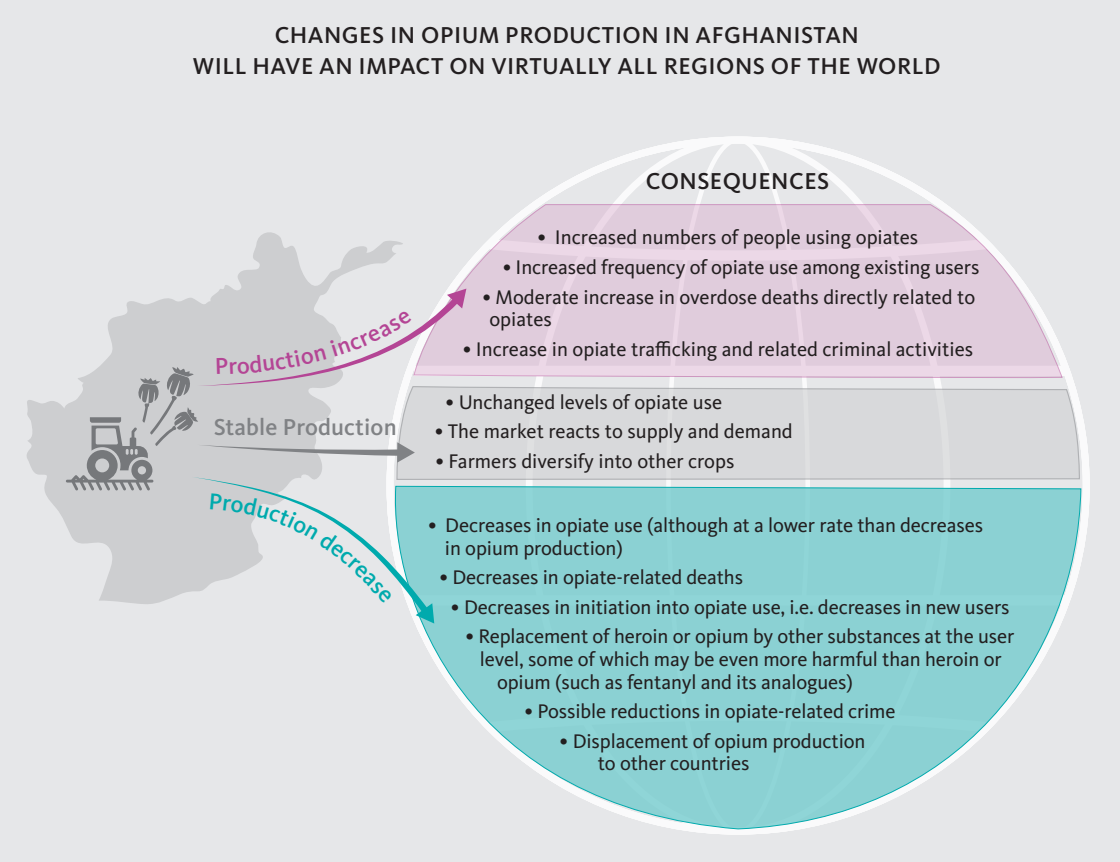
FIG. 67 **Opium production in Afghanistan and seizures of heroin related to Afghan opium production, 1994–2021**



Sources: UNODC, "Drug situation in Afghanistan 2021: latest findings and emerging threats" (November 2021); UNODC and Afghanistan, "Afghanistan opium survey 2020: cultivation and production – executive summary" (April 2021); and UNODC, responses to the annual report questionnaire.

A sudden major increase in opium production in 2022 would not necessarily entail an immediate increase of similar magnitude in heroin manufacture, although increased opium production would eventually lead to upward trends in heroin manufacturing and trafficking.[54] Past seizure data have shown that it can take between 1 and 1½ years for opiates originating in Afghanistan to reach destination countries, depending on the distance from Afghanistan and the mode of transport used.[i] This suggests that an eventual increase in opium production in Afghanistan can be expected, in general, to be reflected, within the same year, in an increase in the supply of opiates in the Near and Middle East and South-West Asia, and a year later in Europe. It can take up to one year for opiates originating in

i For example, there is a good correlation of trends of opium production and opiate seizures made in the regions close to Afghanistan while correlation improves if a one-year time lag is considered for seizures made in regions further away (Africa and Europe).



Afghanistan to reach Western Europe by land, on the Balkan route, but it can take much less time if opiates are shipped by air on direct flights.

Past fluctuations in opium production and prices in Afghanistan have shown that opium prices are quite sensitive to production changes. A possible expansion of opium production and consequent heroin manufacture would probably trigger a decrease in opium and heroin prices in close proximity to the production areas. Prices at the destination would not be subject to the same level of change, but a large increase in production and associated increased purity and lower prices would likely alter the market by making heroin more accessible.

The first to feel the effects of expanded production would be countries neighbouring Afghanistan. The Islamic Republic of Iran, Pakistan and Central Asia already suffer from high rates of opiate prevalence and are exposed to what are possibly the largest quantities of opiates trafficked worldwide. India is one of the world's single largest opiate markets in terms of users[55] and would likely be vulnerable to increased supply, as there are already signs that an intensification of trafficking in opiates originating in Afghanistan may be taking place eastwards, in addition to southwards and westwards along the traditional Balkan route.[56] Consequences could range from expanded use to increased levels of trafficking and associated organized crime. In addition, there is the question of whether the increased availability of opiates could bring an increased number of heroin overdoses[57] and whether increased purity could affect the harm posed by heroin use. The same consequences could be felt later in transit and

destination regions such as Eastern Africa and Europe,[58] although in recent years increases in heroin use driven by availability have not always been observed in Europe following increased opium production in Afghanistan. The risk in Europe in the short to medium term could prove to be more related to a more harmful use of heroin, with users consuming larger and purer quantities of heroin rather than new users being lured into experimenting with heroin.[59]

Even though the influence of changes in the price of opium in Afghanistan on the price and consumption of heroin in destination countries is expected to be rather moderate, it could be more substantial if major changes in Afghan opium prices take place.[j] A literature review suggests that a 10 per cent decline in purity-adjusted heroin prices can translate into an increase of 2.2 to 21 per cent (and most likely between 7 and 11 per cent) in the number of heroin users.[60]

However, the price of heroin is just one of the many factors that influences heroin use.[61] A lower price may not only influence the frequency of use but also the initiation and the number of users, as economic accessibility is one of the factors influencing drug use.[62, k]

Increased opium production may influence increases in the purity of street-level heroin more than changes in retail prices and may pose a higher health risk to users as a result of growing unpredictability regarding levels of purity. Although, studies consistently show that purity is only moderately associated with trends in heroin overdose.[63]

j Following the announced opium poppy ban in Afghanistan in 2000 a subsequent ten-fold increase in opium prices in Afghanistan (between July 2000 and May 2001) resulted in 70 per cent higher purity adjusted heroin prices in Western Europe between the first quarter of 2001 and June 2002. (Thomas Pietschmann, "Price-Setting Behaviour in the Heroin Market," *Bulletin on Narcotics* LVI, Nos. 1 and 2 (2004).

k For the year 2019, the Monitoring the Future study revealed that "experimental use" of marijuana was considered by 11 per cent of the 12th graders to be associated with a "great risk", as compared to 30 per cent for amphetamines, 48 per cent for cocaine and 63 per cent of heroin; similarly, "regular use" was considered to be associated with "high risk" for 31 per cent of the 12th graders for marijuana, 48 per cent for amphetamines, 75 per cent for cocaine and 83 per cent for heroin. (National Institute on Drug Abuse), *Monitoring the Future, 2020, Volume I Secondary School Students* (Ann Arbor, June 2021)).

Possible consequences of increased levels of opium production in Afghanistan in countries supplied by opiates originating in Afghanistan:

- Increased numbers of people using opiates
- Increased frequency of opiate use among existing users
- Moderate increase in overdose deaths directly related to opiates
- Increase in opiate trafficking and related criminal activities

Scenario 2: a new opium poppy ban and/or a substantive reduction in production

This scenario considers the possibility of a drastic reduction in opium production in Afghanistan. Two factors could eventually make this possible: an opium ban by the Taliban and a major replacement of the opium economy with a methamphetamine economy.

How likely is the scenario?

Both factors explored in the scenario have some level of plausibility; the Taliban already introduced an effective opium production ban in 2000 for the year 2001,[64] and the expanding manufacture of methamphetamine in Afghanistan[65] could at least partially substitute for the opium economy if the conditions underlining methamphetamine manufacture and trafficking were different than opium.

The Taliban already announced to the media a ban on drug production and trafficking upon retaking power in August 2021,[66] and on 3 April 2022, issued a decree announcing that the cultivation of opium poppy was prohibited across the country, as well as the production, use or transportation of other narcotic drugs.[67] Given that the opium poppy in Afghanistan was already in the field and almost ready to be harvested at the time the decree was issued in April, it is unlikely that the ban will have an impact on the production of opium in 2022, but it could have a sizable impact on future production if the political will and capacity to enforce it are in place.

Possible impact of the scenario

A long-term effect of a drastic and sustainable reduction of opium production in Afghanistan could affect opioid production outside Afghanistan. The established global demand of heroin would likely call for a supply of heroin or other opioids to compensate for lost Afghan production. Such supply could potentially be met with increased or new cultivation of opium poppies in other countries, or with an increase of illicitly produced synthetic opioids. The licit supply of opium for medical purposes would be too small (about 280 tons) if diverted to replace the current large illicit opium production in Afghanistan (6,800 tons).

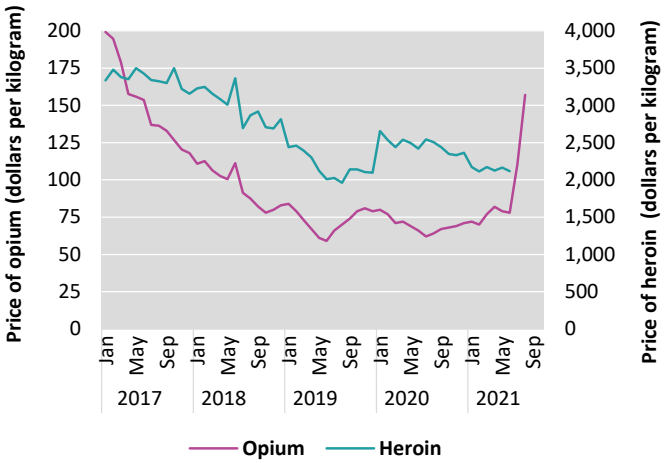
One of the first visible impacts of a sudden decrease in opium production (or the expectation of a sudden decrease) would be on the processing and price of opium.

Opium prices reacted immediately to the decree of April 2022, as they did in anticipation of a possible sudden limitation in the supply of opium when the Taliban took power in 2021. Farm-gate prices doubled between May 2021 and August 2021.[68] Once it became clear that there was a certain level of tolerance of opium cultivation,[69, 70] prices gradually reversed,[71] increasing again around the time when the decree of April 2022 was issued, in reaction to a possible future shortage of opium.

Afghanistan has already experienced in the past a sudden decrease in opium production and the consequences of the recent opium ban in Afghanistan could resemble the situation after the ban of 2000, although that ban was short-lived. At the time, the ban was de facto limited to the areas under the control of the Taliban, which included the main opium-growing provinces of Helmand and Kandahar in the south and Nangarhar in the east, although it did not include the province of Badakshan in north-eastern Afghanistan which was at the time controlled by the Northern Alliance.

The earlier ban came four years after the Taliban had assumed power and took place in stages; firstly, a decree was issued in 1999 to curb opium poppy cultivation by one third,[72] and that was followed a year later by another decree fully banning opium poppy cultivation in 2001. Following those decrees, the area under opium poppy cultivation in Afghanistan decreased by, respectively, 10 per cent in 2000[73] and 90 per cent in 2011, and by almost 100 per cent in Taliban-controlled areas.[74]

FIG. 68 Farm-gate price of dry opium and price of high-quality heroin in Afghanistan, January 2017–August 2021



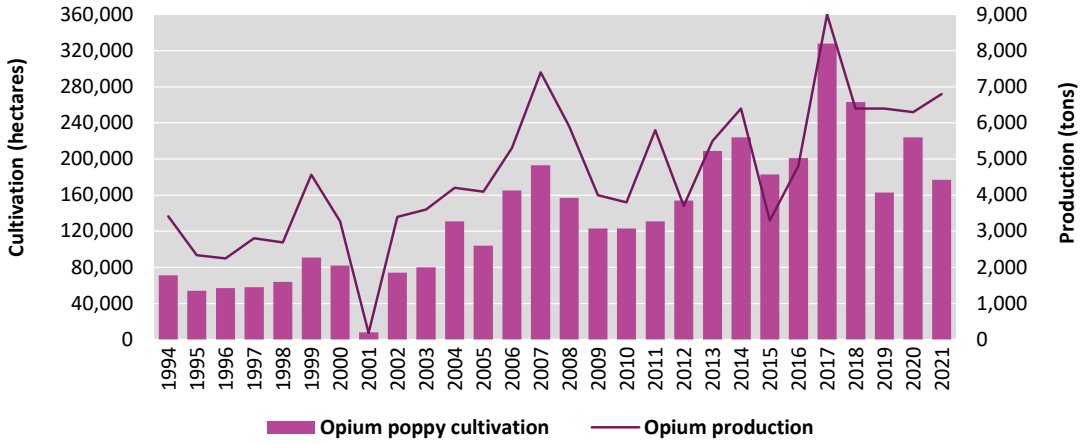
Sources: Afghanistan, Ministry of Interior Affairs, "Afghanistan drug price monitoring monthly report" (June 2021), and previous years and UNODC, Drug situation in Afghanistan 2021 (November 2021).

In contrast to cultivation of opium, trade in the substance was not banned and trafficking in opiates became more profitable, owing to the sharp increase in opiate prices.

The opium ban of 2001 was enforced for one year; the resulting market shock was short-lived and was felt more in Afghanistan than elsewhere. Seizures of heroin linked to opiates originating in Afghanistan exhibited a smooth decline in the years following 2001, suggesting that the effects of the drastic decline in opium cultivation and production in Afghanistan were smoothly absorbed along the trafficking chain.[75]

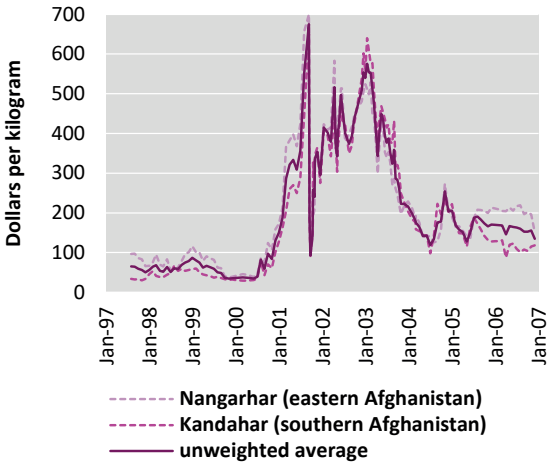
Left without viable alternatives, farmers were hit hardest by the ban, losing a key source of income,[76] and the significant increase in opium production after 2001 was in part due to their attempts to alleviate their debt burden.[77] The economic consequences of any new opium poppy ban would probably be even more significant for farmers than in 2001. The profits from

FIG. 69 Area under opium poppy cultivation and level of opium production in Afghanistan, 1994–2021



Sources: UNODC, "Drug situation in Afghanistan 2021: latest findings and emerging threats" (November 2021); and UNODC and Afghanistan, "Afghanistan opium survey 2020: cultivation and production – executive summary" (April 2021).

FIG. 70 Price of dry opium collected from traders in Afghanistan, August 1997–December 2006



Source: UNODC, *World Drug Report 2007* (Vienna, 2007).

opium production have increased since 2001. The gross income of farmers from opium was estimated at about $150 million per year ($250 million in 2021 constant United States dollars[78]) between 1994 and 2000 and reached a high of between $180 million and $250 million in 1999 ($292-$407 million in 2021 constant United States dollars)[79], equivalent to some 5 per cent of Afghan GDP. In the following years, farmers' income from opium varied according to the level of opium production and opium prices and reached $425 million in 2021.[80] In 2019, opium cultivation generated 191,000 full-time jobs in Afghanistan, and beyond cultivation and production, heroin manufacture and opiate trafficking generated a large economy; overall income from the opiate sector in Afghanistan amounted to between $1.8 billion and $2.7 billion in 2021, equivalent to between 6 and 11 per cent of GDP.[81]

Any significant expansion of methamphetamine manufacture as a substitute for opium cultivation could potentially shift the illegal drug economy – but only if policies and capacities are concentrated exclusively on banning opium production and trade – although the distribution of profits would likely not be the same, as farmers would potentially lose out while other actors would make gains. The decree of April 2022 targets the production of and trade in all drugs, including methamphetamine, and a ban on the Ephedra plant, the main precursor used in the manufacture of methamphetamine in Afghanistan, was already announced by the Taliban in December 2021, leading, according to media sources, to a doubling of the wholesale prices of methamphetamine.[82] It still remains to be seen if

opium and methamphetamine will be targeted differently in practice.

Outside of Afghanistan, the impact of reduced production would probably be felt gradually, but would still be significant for final consumers. While Afghan farmers do not seem to keep significant quantities of opium in stock after harvest,[83] inventories along the trafficking chain would likely be able to cushion the impact of reduced supply for one or two years.[84, 85] The effects of any longer-term reduction would be felt more sharply.

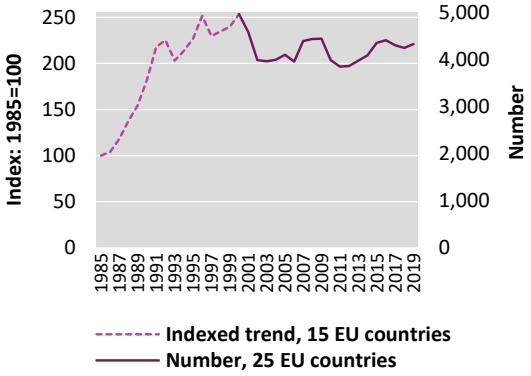
The impact on countries in closer proximity to Afghanistan would be more immediate and larger. The Islamic Republic of Iran was immediately affected by the ban of 2001, which resulted quickly in reduced availability and increased prices. As coping strategies, some users of opium switched to heroin and users of heroin switched from inhaling to injecting.[86] Even though, in comparison with the early 2000s, the country now has an increasing number of people enrolled in long-term opioid agonist treatment programmes[87] and a broad range of interventions to mitigate the health consequences of drug use,[88] the impact of a sudden reduction in the supply of opiates could be problematic for opiate users.

Further afield, in destination countries, reduced heroin availability was observed following the ban of 2001, although it was far from equivalent to the decline in opium production of about 94 per cent. In those countries, the initial impact of a new ban would be softer, and it would take longer to be fully felt. The ban of 2001 brought some sharp price fluctuations in destination countries[l] but they were quickly reversed, as opium production in Afghanistan increased again significantly in 2002. The dynamics of opiate use in Western Europe were affected by the opium ban of 2001 in Afghanistan to some extent with the heroin market completely collapsing in Estonia and Finland and a subsequent long-term decrease in new demands for treatment due to heroin and an aging population of opioid users in the subregion suggesting low recruitment into heroin use.[89] However, other factors may also have played a role.[90]

Elsewhere in Europe, the ban of 2001 appears to have led to the collapse of some local heroin markets, with other opioids taking the place of heroin, for example, fentanyl in Estonia and buprenorphine in Finland.[91] This scenario could play out again under any future ban, given that the manufacture of synthetic opioids, notably fentanyl analogues, has become far more widespread over the last three decades.

Another sudden disruption in the supply of heroin showed the potential of decreasing health-related harms. When Australia experienced sudden and dramatic decreases in the availability of heroin in early 2001, the results were increased prices and decreased purity,[92] together with a reduction in fatal and non-fatal heroin overdoses by 40–85 per cent, as well as an overall reduction in acquisitive crime committed by drug users.[93] The year of this disruption was largely only coincidentally related to the opium ban in

FIG. 71 **Drug-related overdose deaths in the European Union, 1985–2019**



Sources: UNODC calculations based on EMDDDA, "Statistical Bulletin 2021", "Overdose deaths", (based on data from selection B and complemented, in case of missing data, with data from selection D) (available at www.emcdda.europa.eu/data/stats2021_en); and EMCDDA, *Annual Report 2003: The State of the Drugs Problem in the European Union and Norway* (Lisbon, October 2003).

Note: Data used in the calculations for the period 2000–2019 have been available from countries of the European Union, except Cyprus and Poland; however, even if these data were available, they would be very unlikely to significantly change the overall trends shown in the figure.

l While opium prices rose tenfold in Afghanistan, in countries neighbouring Afghanistan prices rose four to five times and heroin prices in these countries rose two to three times. Increases of heroin retail prices in Western Europe were far more moderate (some 20 per cent), although, taking purity changes into account, the increase of purity adjusted heroin retail prices reached 70 per cent. (Thomas Pietschmann, "Price-Setting Behaviour in the Heroin Market," *Bulletin on Narcotics* LVI, Nos. 1 and 2 (2004).

Possible consequences of decreased levels of opium production for countries supplied with opium and heroin are:

- Decreases in opiate use (although at a lower rate than decreases in opium production)
- Decreases in opiate-induced deaths
- Decreases in initiation into opiate use, i.e. decreases in new users
- Replacement of heroin or opium by other substances at the user level, some of which may be even more harmful than heroin or opium (such as fentanyl and its analogues)
- Possible reductions in opiate-related crime

Afghanistan, as the heroin in Australia was principally supplied from Myanmar, and the ban in Afghanistan only prevented traffickers from turning to an alternative source when needed.

Scenario 3: no significant change in opium production in Afghanistan

If policy interventions and socioeconomic conditions do not see major changes, the opium market in Afghanistan is likely to follow the dynamics of supply and demand.

How likely is the scenario?

Trends in opium market indicators, such as high levels of opium production, falling opium prices (before the spike due to the political instability in 2021) and a stable number of users of opiates, all suggest that the opium market in Afghanistan may be close to saturation.[94] Unless new markets for opiates originating in Afghanistan emerge or existing markets are more aggressively targeted with supply-driven expansions, the level of opium cultivation and production may not noticeably change.

Possible impact of the scenario

Opium price, both alone and in comparison, with the price of other legal crops, is one of the decisive factors in the level of cultivation since high prices provide a greater incentive to farmers to choose opium over other crops. Periods of significant increases in opium production, such as the one observed in recent years in Afghanistan, have repeatedly been followed by significant decreases in opium prices, which in turn have reduced the incentive for farmers to cultivate opium poppy. Thus, opium market dynamics alone could result in a declining production. The devaluation of the Afghan afghani in 2021 has increased prices for all imported goods and could further reduce incentives for opium production, as alternative crops could become more attractive.

The improved security situation in Afghanistan is also providing farmers with increased opportunities to sell agricultural products at markets. Selling opium has always been easier for farmers because buyers come directly to the farm, while other agricultural products need to be sold at markets.

Possible consequences of unchanged levels of opium production:

- Unchanged levels of opiate use
- The market reacts to supply and demand
- Farmers diversify into other crops

South-East Asia

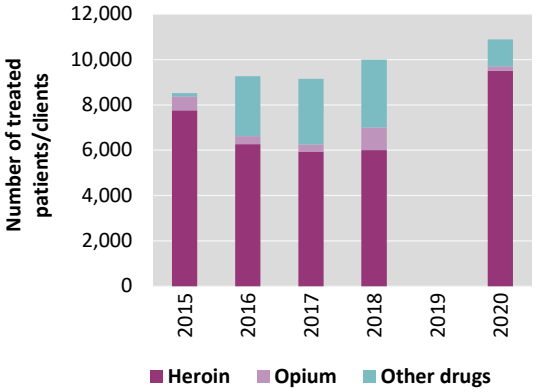
East and South-East Asia: opioids likely playing a small or decreasing role in drug demand, except in Myanmar and Viet Nam

The estimated prevalence of opioid use in East and South-East Asia is relatively low by global average. In 2020, 0.2 per cent of the population in the region aged 15–64 had used an opioid in the past year, corresponding to 3.1 million users. The estimated prevalence has remained relatively stable since 2010, when it was 0.3 per cent. However, for most countries in the region, recent national survey data are not available, which makes it difficult to understand the actual overall level of opioid use.

In the period 2019–2020, opioid users formed a sizeable proportion of persons treated for drug use disorders in Myanmar (almost 90 per cent), Viet Nam,

China (approximately 40 per cent), and Malaysia (36 per cent). The proportion was lower in Singapore (14.7 per cent), and opioids played a relatively minor role in drug treatment in other countries in the region (less than 5 per cent of those treated).[95] Myanmar and Viet Nam have reported increasing numbers of people treated for opioid use, with Viet Nam reporting a total of 162,225 opioid users treated in opioid agonist treatment programmes between 2017–2020, representing a 10 per cent increase compared with the preceding five-year period.

FIG. 72 Trends in drug treatment in Myanmar, 2015–2020

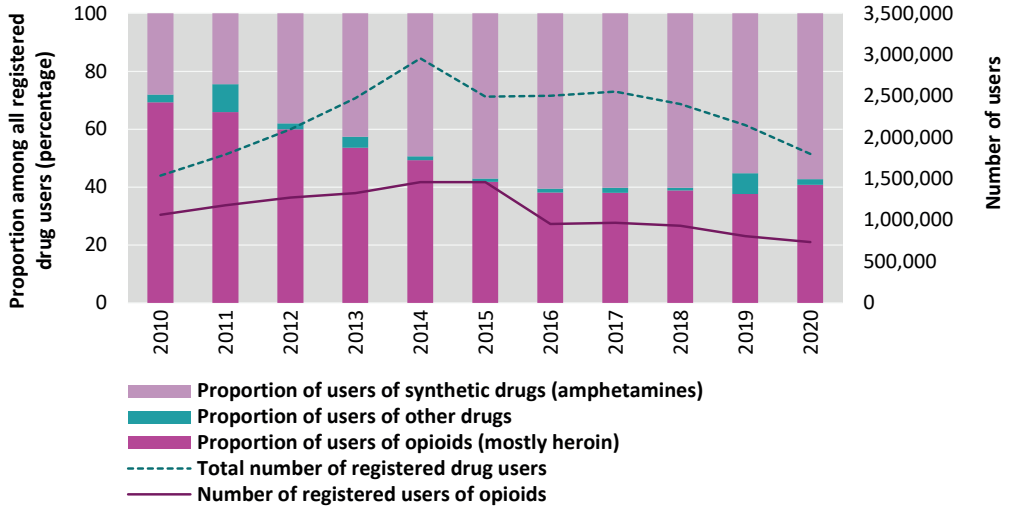


Source: UNODC, responses to the annual report questionnaire.
Note: There is no data available for 2019.

Regarding the type of opioid used, the most prevalent opioid used among high-risk drug users in the region was, by far, heroin, followed by opium. The non-medical use of methadone, codeine and morphine was also reported, and Timor-Leste reported non-medical use of tramadol as the most prevalent opioid in use.

In China, data from the national register of drug users suggest a decrease in the importance of opioids (mainly heroin) and an increase in the importance of amphetamines among registered users over the last 10 years. However, the course of this trend in 2020 is unclear, as fewer drug users were identified by the Chinese authorities in that year, owing to disruptions in the availability of controlled drugs related to the COVID-19 pandemic.[96] The single most used drug by registered users of opioids in China was heroin. There is also evidence of the non-medical use of pharmaceutical opioids. For example, in a large national school survey

FIG. 73 Trends in registered drug users, China, 2010–2020



Source: China, National Narcotics Control Commission, *Report on Drug Control in China*, different years in the period 2010–2020.

in 2017, 2.1 per cent of students[m] reported the non-medical use of pharmaceutical opioids, a category including codeine, "liquorice tablets" (containing opium), tramadol hydrochloride and diphenoxylate, in the past year and 0.6 per cent were frequent users.[97] Drug use among the young population is typically higher than among the general population. A nationwide wastewater analysis-based study conducted in 30 cities across China found no evidence of significant non-medical use of fentanyl or tramadol until 2019. Levels of use identified were generally low and corresponded to medical prescription practices.[98] Another study concluded that heroin use had remained largely stable throughout 2019, although higher levels of use were observed in south-western, central and north-western China. On the basis of correlation analysis, polydrug use patterns involving the use of heroin with cocaine were assumed.[99]

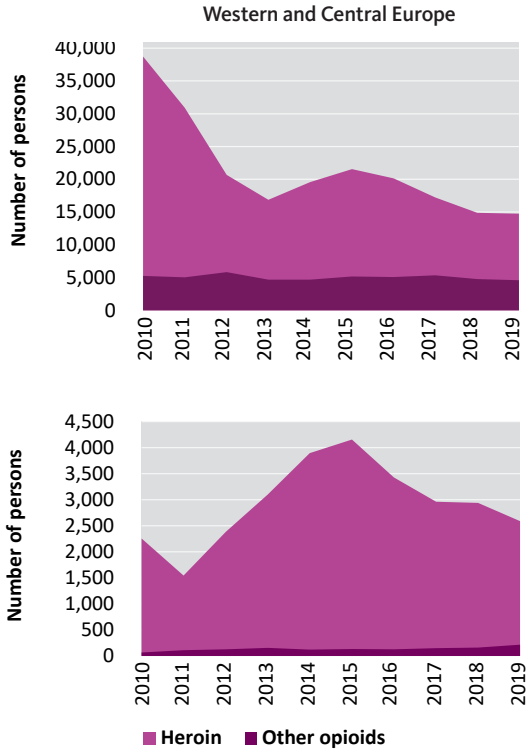
Europe: no increase in the number of new opioid users, while majority of the estimated aging users are likely in drug treatment

The estimated prevalence of opioid use in Europe is lower than the global average, standing at 0.7 per cent of the population aged 15–64, or 3.6 million users of opioids. Within the region, the Eastern and South-Eastern European subregion has a slightly higher estimated prevalence (0.8 per cent) than Western and Central Europe (0.6 per cent). The vast majority of opioid users in Europe are users of opiates, with a prevalence of 0.6 per cent. In other words, 3.1 million of the 3.6 million opioid users in Europe were estimated to have used opiates in 2020.

According to drug treatment and survey data, the most used opioid by far is heroin, although among the general populations of some countries, the level of non-medical use of pharmaceutical opioids is higher than the level of use of heroin. Among high-risk opioid users in some countries, other opioids have been dominant, for example, buprenorphine in Finland and, until recently, fentanyl in Estonia.

Diverted opioid substitution treatment medications, such as buprenorphine or methadone, are the second most prevalent group of opioids used non-medically,

FIG. 74 **First-time entrants into opioid treatment in two subregions of Europe, 2010–2019**



Source: EMCDDA, "Statistical Bulletin 2021".

Note: Data for Western and Central Europe exclude States and territories for which no data were available or significant missing data points occurred (Andorra, Germany, Iceland, Liechtenstein, Monaco, Norway, San Marino, Sweden, Switzerland, Faroe Islands, Gibraltar and Holy See). Data for South-Eastern Europe include only Bulgaria, Croatia, Romania, and Turkey. Respective data were not available for Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, Serbia, or Kosovo[n]. A total of 4.4 per cent of the data points were missing and another 4.4 per cent were interpolated using the geometric mean of the neighbouring values or by assuming stable trends in the first and last missing values of the time series.

and[n] the presence of illicitly manufactured synthetic opioids has also been reported.[100] The non-medical use of tramadol and fentanyl has been reported in the region, albeit on a relatively limited scale.[101] Tramadol causes hundreds of deaths each year, but they are typically concentrated in a few countries.[102] While the use of fentanyl seems to be declining in Estonia, other opioids are becoming more prevalent, such as the potent

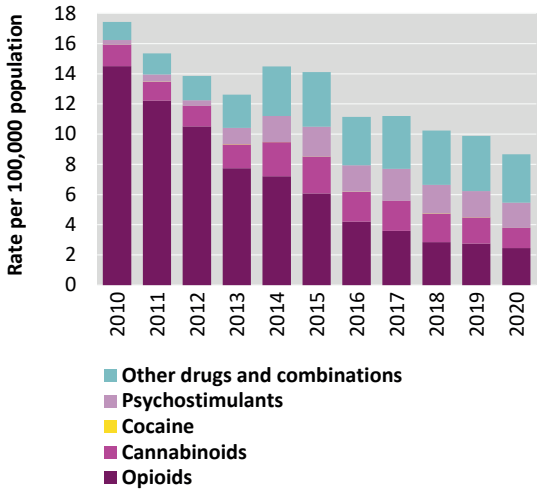
m Students were attending 7th–12th grade and their mean age was 15.2 years (SD+-1.8).

n References to Kosovo shall be understood to be in the context of Security Council resolution 1244 (1999).

synthetic opioid isotonitazene, which has been detected in drug-related deaths in Estonia, Switzerland and the United Kingdom and in law enforcement data of several other European countries.[103] However, isotonitazene is assumed to be mixed mainly with heroin on the illicit market instead of being used on its own directly by the user.[104]

On the basis of a combination of indicators, it appears that long-term trends in opioid use in Europe have either remained stable or exhibited a moderate decline. New admissions to drug treatment for opioid use disorders have been declining since 2010, mainly in Western and Central Europe and the Russian Federation, but also in South-Eastern Europe since 2015. Among heroin users entering treatment in the European Union, 19 per cent were women.[105]

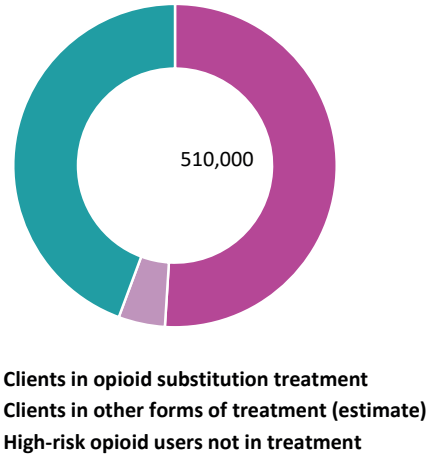
FIG. 75 First-time entrants into drug treatment, Russian Federation, 2006–2020



Source: UNODC, responses to the annual report questionnaire.

Of the population of high-risk opioid users in the European Union (estimated at about 1 million people, or 0.35 per cent of the population aged 15–64 in 2019),[106] the majority are in some form of drug treatment, most typically opioid substitution treatment (more than half a million in 2019). An additional 2-17% receive other types of drug treatment.[107] Drug-related deaths have been moderately increasing over the medium term and have stabilized in recent years. The increase is almost completely explained by aging among this vulnerable group.[108] Even if there is currently no evidence of an increase in the initiation into opioid use, monitoring systems may be less sensitive to new initiates[109] or may register their existence with certain delays.

FIG. 76 High-risk opioid users in the European Union, 2019

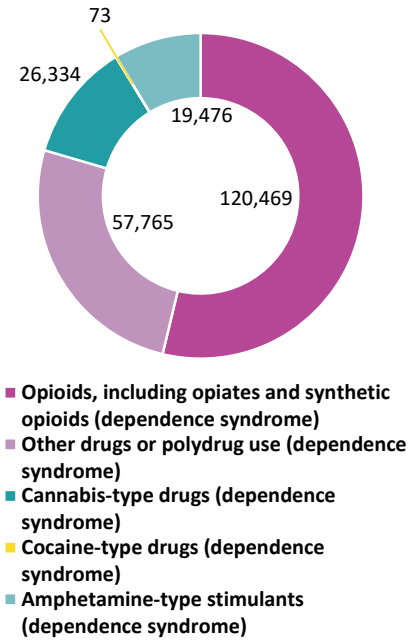


Source: EMCDDA, *European Drug Report 2021: Trends and Developments* (Luxembourg, 2021) and EMCDDA, *"Balancing Access to Opioid Substitution Treatment with Preventing the Diversion of Opioid Substitution Medications in Europe: Challenges and Implications."* (Luxembourg, 2021)

In the Russian Federation, although the share of people entering treatment for opioid use disorders for the first time continues to decline, opioids remain the primary type of drugs used by the majority of all patients treated in the country. Persons treated for opioid dependence are in general, chronic, long-term users; in 2020, such persons outnumbered first-time entrants into treatment for opioid use by 34 to 1.

In 2020, opioid-related deaths in Europe did not exhibit the sharp increase observed in North America. However, some countries and territories did report increases, albeit in line with longer-term trends. Belarus, Finland,[110] England and Wales (UK),[111] the

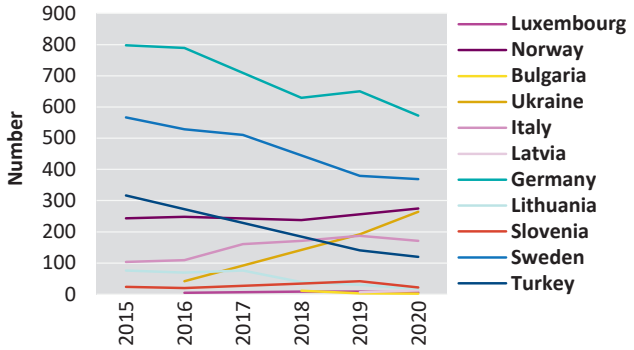
FIG. 77 People in drug treatment with dependence syndrome diagnosis, by type of drug used, Russian Federation, 2020



Source: UNODC, responses to the annual report questionnaire.

Note: Data include all people in drug treatment in 2020, except for 157,388 clients who were diagnosed with "harmful use", as opposed to a syndrome of dependence on specific drugs.

FIG. 78 Trends in deaths related directly to opioids in selected European countries, 2015–2020



Source: UNODC, responses to the annual report questionnaire; EMCDDA, "Statistical Bulletin 2021"; and Trimbos Institute, "Nationale Drug Monitor", "5.7.3 Sterfte in Nederland" (available at www.nationaledrugmonitor.nl/opiaten-sterfte-in-nederland/ (in Dutch)).

Netherlands,[112] Norway,[113] and Ukraine all reported increases in post-mortem findings of opioids, predominantly pharmaceutical opioids, in 2020.[114] The list of pharmaceutical opioids involved in those increases was diverse and included mainly buprenorphine in Finland, methadone in Belarus, Ukraine, and England and Wales (UK), and various other substances, including codeine, buprenorphine, morphine, pethidine, tramadol and fentanyl, in other countries. Some European countries, among them Germany, reported decreases.

North America: opioid-related deaths increased to an unprecedented high level during the COVID-19 pandemic

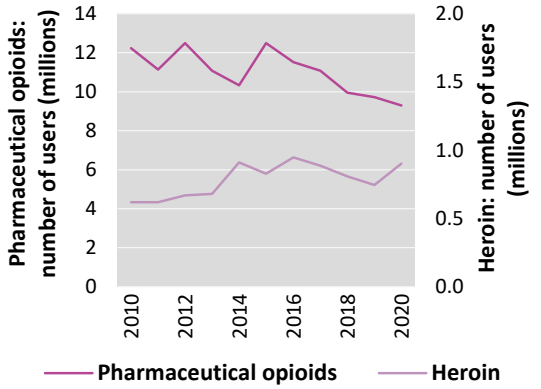
The estimated prevalence of opioid use in North America is high in comparison with the global average, with an estimated 3.4 per cent of the population aged 15–64 years reporting past-year opioid use and 0.7 per cent reporting use of opiates in 2020. This translates to 11 million past-year opioid users and 2.4 million past-year users of opiates in the subregion.

According to a national household survey, in 2020,[o] it is estimated that 9.5 million people in the United States had used opioids non-medically in the past year. Of these, 9.3 million people had used pharmaceutical opioids in a manner not according to a doctor's prescription, 902,000 people had used heroin, and about 700,000 people had used both pharmaceutical opioids for non-medical purposes and heroin.[115] However, taking into account general methodological considerations[p] and other sources using indirect esti-

o The US Substance Abuse and Mental Health Services Administration (SAMHSA) advises to exercise caution when comparing the 2020 estimates with previous years' estimates due to the necessary methodological changes (differing periods of data collection, online data collection and changes in the questionnaire) in the data collection process related to the pandemic situation. Therefore, the comparability of the 2020 data collection round with the previous rounds is unknown (https://www.samhsa.gov/data/release/2020-national-survey-drug-use-and-health-nsduh-releases).

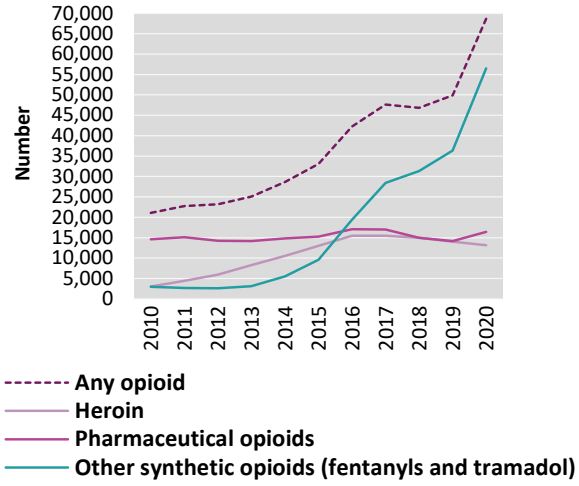
p Some populations of intensive opioid users may be outside of the sampling frame – either institutionalized in prisons or residential drug treatment facilities, not living at a steady address, or less willing to respond to the survey.

FIG. 79 Trends in past-year use of heroin and non-medical use of pharmaceutical opioids, as reported in household surveys, United States, 2010–2020



Source: United States, Substance Abuse and Mental Health Services Administration, results from the 2020 National Survey on Drug Use and Health: Detailed Tables (Rockville, Maryland, Center for Behavioral Health Statistics and Quality, 2021).

FIG. 80 Trends in opioid overdose deaths by main drug type (considered alone or in combination with other substances), United States, 2010–2020



Sources: United States, Centers for Disease Control and Prevention, National Center for Health Statistics, Wide-ranging Online Data for Epidemiologic Research (CDC WONDER, https://wonder.cdc.gov/mcd.html). Available at https://nida.nih.gov/sites/default/files/Overdose_data_1999-2020_1.5.22.xlsx

Note: The category "Any opioid" includes all categories of opioid overdose deaths. The remaining categories include deaths with and without the presence of other substances including opioids.

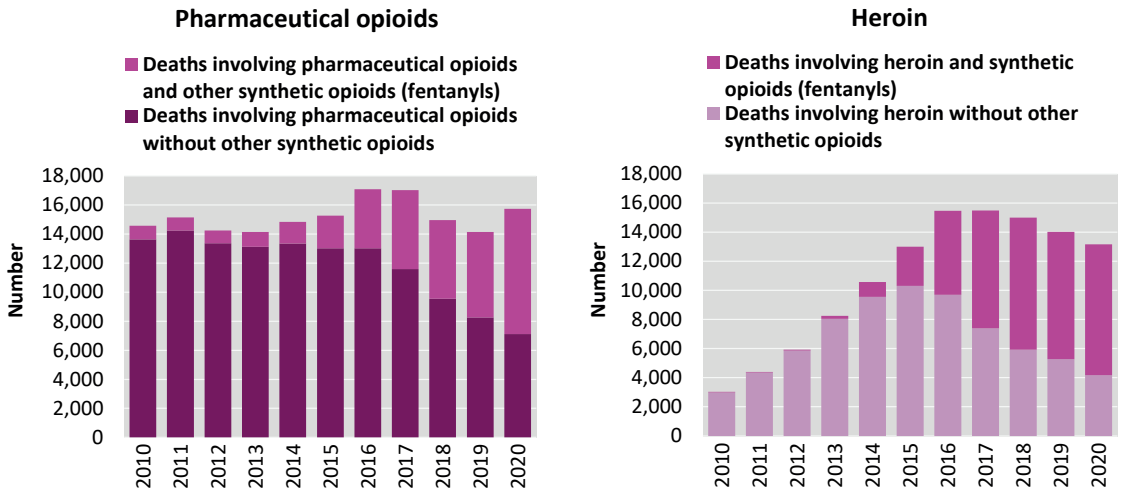
mation methods, the prevalence of heroin use may have been underestimated in the survey.[116]

The substances currently causing the most harm, clearly reflected in drug-related mortality in the United States, are fentanyls. The 2020 national household survey[117] included a question on the misuse of fentanyl products. Based on the responses provided, it was estimated that 0.1 per cent of people aged 12 or older (or 356,000 people) had misused those products. However, users may be unaware that they are using fentanyls because they are mixed to varying degrees with other drugs.

Since 2013, the United States has been facing an unprecedented rise in overdose deaths, predominantly driven by fentanyls, while the role of heroin has declined. Other, non-fentanyl synthetic opioids (e.g. isotonitazine and brorphine) have also been observed in small, but rising proportions.[118] The relative slowdown of the rising trend in overdose deaths between 2017 and 2019 coincided with a relative lack of availability of carfentanil at that time,[119] however, other factors may have played a role too. The current rise of fentanyls is considered to be predominantly driven by supply rather than demand. Fentanyls on the United States drugs market have been generally sold as "heroin", identified as "fentanyl-adulterated or substituted heroin (FASH)". There are several market factors that facilitate this, for example, fentanyls are inexpensive, can be produced efficiently, and can be sold on online markets.[120] More recently, demand for fentanyl has been created as a result of its high potency and low price and the fact that, owing to its intense onset, the user experiences euphoria that may have been lost owing to the development of tolerance to heroin. As tolerance increases with use of fentanyl-laced heroin or fentanyl, other products on the market become insufficient to satisfy users' opioid requirements.[121]

Women constituted approximately 30 per cent of all drug overdose deaths in the United States in 2020. Similarly, 29 per cent of all deaths involving any opioid

FIG. 81 Trends in overdose deaths attributed to pharmaceutical opioids and heroin, United States, 2010–2020

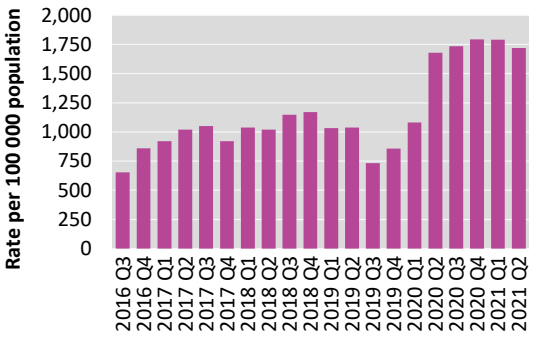


Source: United States, Centers for Disease Control and Prevention, National Center for Health Statistics, Wide-ranging Online Data for Epidemiologic Research (CDC WONDER), "Multiple cause of death 2000–2020".

were women. The proportion of women in deaths involving heroin was slightly lower (25 per cent), but women constituted almost half of all deaths in cases involving the presence of pharmaceutical opioids without synthetic opioids other than methadone (47 per cent).[122]

On the basis of a national survey conducted in Canada in 2019, it was estimated that 1 per cent of Canadians aged 15 years or older had engaged in "problematic use of opioid pain relievers" in the past year. Canada has also been experiencing an increasing trend in drug-induced overdose deaths related to the proliferation of synthetic opioids, mainly fentanyl. Fentanyl was found in 86 per cent of the samples of people who had died as a result of opioid overdose in the first half of 2021[123]. In the majority of cases of drug overdose death in British Columbia since 2017, the route of drug administration was smoking, as opposed to injecting, which has had a diminishing role in overdose deaths.[124] This is contrary to data observed elsewhere, where injecting has been strongly associated with the risk of dying from overdose.[125]

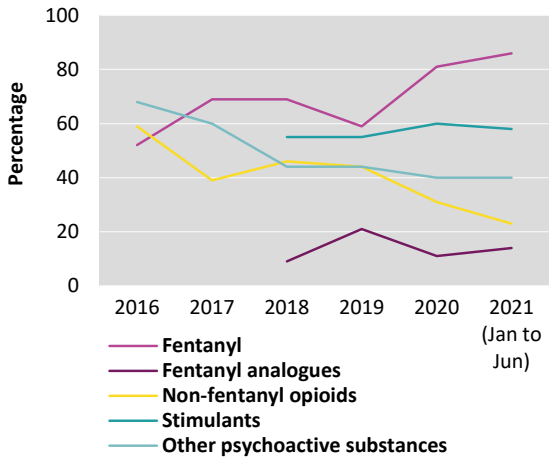
FIG. 82 Trends in opioid overdose deaths in Canada, by quarter, 2016–2021



Source: Special Advisory Committee on the Epidemic of Opioid Overdoses, Opioid- and Stimulant-related Harms in Canada (Ottawa: Public Health Agency of Canada, December 2021). Available at https://health-infobase.canada.ca/substance-related-harms/opioids-stimulants.

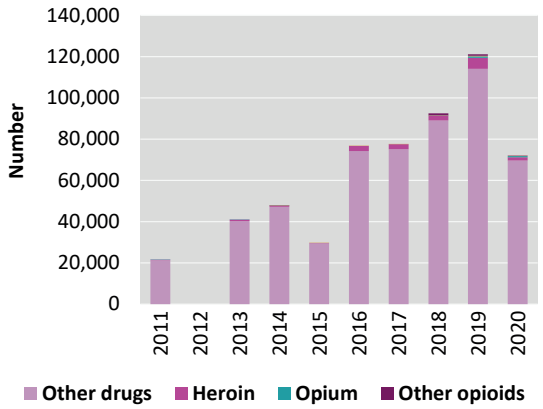
During the COVID-19 pandemic, the upward trend in opioid-related (mainly fentanyls-related) overdose mortality has further accelerated in North America.[126] In the United States, the number of deaths related

FIG. 83 Trends in substances found in opioid overdose deaths in Canada, 2016–2021



Source: Public Health Agency of Canada, *Apparent Opioid and Stimulant Toxicity Deaths. Surveillance of Opioid- and Stimulant-Related Harms in Canada* (Ottawa, 2021). Available at https://health-infobase.canada.ca/substance-related-harms/opioids-stimulants.

FIG. 84 People in drug treatment in Mexico by primary drug, 2011–2020



Source: UNODC, responses of Mexico to the annual report questionnaire.

Note: there is no available data for 2012.

directly to drugs stood at an all-time high of 91,799 in 2020[127] and the provisional estimate for 2021 is 107,622.[128] In Canada, overdose mortality has also increased markedly, with the number of opioid-related deaths per quarter consistently about 50 per cent higher than pre-pandemic figures. Wastewater monitoring programmes have suggested increased fentanyl consumption in the Canadian cities of Edmonton, Halifax, Montreal, Toronto, and Vancouver since the onset of the pandemic.[129]

The reasons for these increases are not fully understood and they are being investigated. Among possible hypotheses is the spreading of fentanyls into new geographical areas of the United States,[130] while another possible factor is the observed sharp increase in occurrences of falsified pharmaceutical drugs containing fentanyl and methamphetamine.[131] There are probably also factors related to aggravated racial[132] and social health disparities.[133] Conditions created by the COVID-19 pandemic may also have played a role. Social distancing measures leading to decreased access to in-person treatment or using opioids more often while alone may also have been associated with the increasing level of overdoses.[134, 135]

The opioid crisis was recognized as a public health emergency in April 2016 by the Provincial Health Officer of British Columbia, Canada, and in 2017 by the Government of the United States. Both countries have introduced novel ways to combat the crisis. Canada has been testing fentanyl-assisted substitution treatment as a treatment for fentanyl dependence,[136] as well as a new "safe supply" programme aimed at substituting the high-risk illicit supply with pharmaceutical-grade opioids, stimulants and benzodiazepines in drug users testing positive for COVID-19 or at risk of it, with a view to reducing their risks of poisoning, withdrawal, and exposure to COVID-19.[137] But despite these efforts, overdose deaths have continued to increase, suggesting that market dynamics have a stronger foothold in driving patterns of harm.

Opioids currently do not play a major role in drug use in Mexico, where the latest general population-level data available are from 2016, when 0.1 per cent of population aged 12–65 reported heroin use in the past year. Although heroin was the most injected drug in the country in 2020, followed by acetylated opium, opioids only play a minor role in drug treatment admissions.

However, a relatively high prevalence of heroin use has been documented near Mexico's northern border with the United States.[138] Heroin use in this region has

been associated with economic disadvantage, sex work, internal displacement and the presence of drug trafficking routes.[139] Particularly high prevalence of use has been observed among deportees from the United States. Other risk factors exist in Mexico that may contribute to increases in opioid use in the future, such as production and trafficking of heroin, trauma related to deportation, and changing opioid-prescription practices.[140] Moreover, similarly to other countries in North America, the lacing of heroin with fentanyl has been documented close to Mexico's northern border.[141]

Tramadol misuse in regional epidemics: North Africa, West and Central Africa, the Near and Middle East/South-West Asia

Tramadol is a synthetic opioid used in pain management of moderate to severe pain, though it also has a mood enhancement effect. Administration of higher than therapeutic doses of tramadol leads to a similar dependence profile to that of morphine and other opioids, although the abuse potential in earlier epidemiological studies had been reported as lower than other opioids.[142] Adverse effects include dizziness, nausea, constipation and headache and withdrawal symptom include, apart from the typical opioid withdrawal symptoms, also hallucinations, paranoia, confusion and sensory abnormalities.[143] The non-medical use of the substance is predominantly oral.

Tramadol is not internationally controlled. However, national control mechanisms are often in place; in most countries, medical tramadol is a prescription-only medicine.

Despite the limited data available on drug use in general, it is clear that the non-medical use of tramadol has become more prevalent in North and West Africa, the Near and Middle East, and parts of South-West Asia in the last 10 years, with signs of increase, especially in the medium term. Numerous countries have reported evidence of non-medical use of the drug,[144, 145, 146] with Algeria, Burkina Faso, Egypt, Iraq, the Niger, Nigeria, Qatar, Sierra Leone and Togo reporting tramadol to be the most used opioid substance in their territory. Other countries with evidence of non-medical use of tramadol were Ghana, the Islamic Republic of Iran, Jordan, Lebanon, Liberia, Libya, Mauritius, Morocco,[147] Saudi Arabia, the State of Palestine, the United Arab Emirates[148] and Yemen.[149]

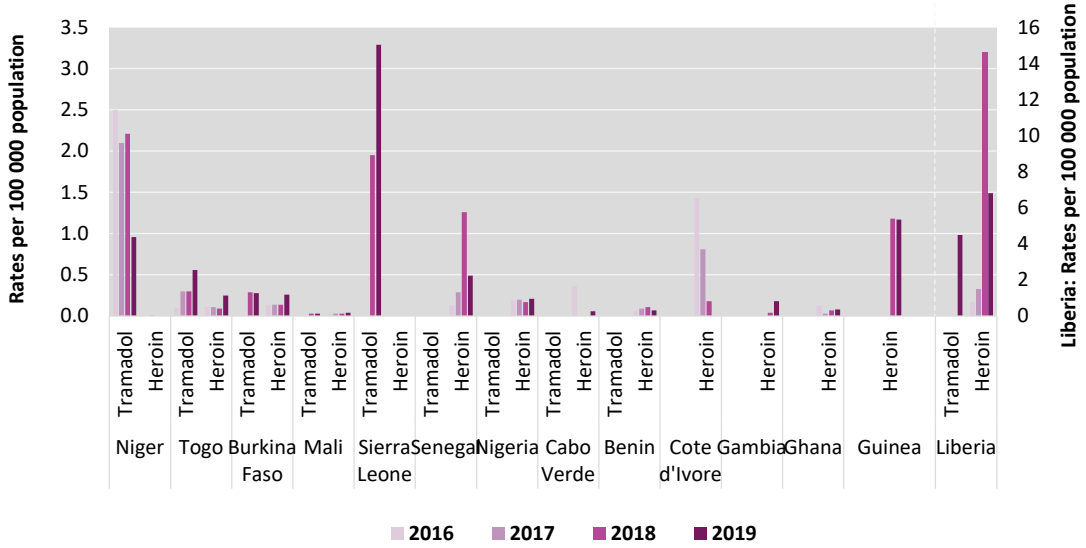
Prevalence data regarding the misuse of tramadol in the general populations of the respective countries are scarce but do exist. It was estimated that in Nigeria, in 2017, there were 4.6 million non-medical users of pharmaceutical opioids, of whom 3 million were men. Of the non-medical users of pharmaceutical opioids, most had used tramadol and, to a lesser extent, codeine, or morphine, in the past year, representing 4.7 per cent of the adult population aged 15-64. The prevalence was 3.3 per cent among women and 6 per cent among men. A total of 20 per cent of pharmaceutical opioid users met self-assessed International Classification of Diseases and Related Health Problems (ICD-10) criteria for dependence.[150] In Egypt, an estimated 3 per cent of the adult population used tramadol non-medically in 2016.[151] A review study conducted in the Islamic Republic of Iran derived a pooled estimate of 4.9 per cent of past-year non-medical use of

TABLE 8 Estimated prevalence and number of users of opioids and opiates in selected subregions, 2020

	Opioid use		Opiate use	
	Prevalence (percentage)	Number of users (millions)	Prevalence (percentage)	Number of users (millions)
North Africa	1.1	1.6	1.1	1.6
West and Central Africa	2.4	6.9	0.2	0.5
Near and Middle East/South-West Asia	3.2	10.5	1.8	5.8

Source: UNODC, responses to the annual report questionnaire.:

FIG. 85 People in treatment for tramadol and heroin use disorders in West Africa, 2016–2019



Source: West African Epidemiology Network on Drug Use (WENDU) Report: Statistics and Trends on Illicit Drug Use and Supply 2014–2017 (2019) and West African Epidemiology Network on Drug Use (WENDU) Report: Statistics and Trends on Illicit Drug Use and Supply 2018–2019 (2021).

tramadol among males and 0.8 per cent among females.[152] Similar levels of use were estimated among the student population (4.8 per cent and 0.7 per cent among male and female students, respectively). Regular non-medical use and dependence on the substance was also documented in the Islamic Republic of Iran, along with other negative health consequences. It was estimated that 13.1 per cent of non-fatal drug poisonings and 5.7 per cent of fatal drug poisonings was due to tramadol.[153] In a 2018 study in Riyadh, Saudi Arabia, 8.6 per cent of high school and college students reported non-medical tramadol use.[154]

There are several factors at play in the wide geographical spread and relatively high prevalence of tramadol use in these regions. Besides the usual factors that affect drug use, a factor reported across study populations is the use of tramadol to enhance sexual stamina in men.[155] Another common reason for tramadol use among workers and young people is the perception that tramadol use leads to higher energy levels and improvement of performance.[156] Tramadol's relatively easy availability in pharmacies and on the illicit market, low cost and the perception of tramadol as safe because it is a prescription medication also play a role.[157]

Some professions seem to be particularly affected by a high prevalence of non-medical use of tramadol. Studies among farmers and commercial drivers in Ghana found prevalence levels of tramadol misuse of 25–28 per cent.[158] The non-medical use of tramadol was notably high among workers in an industrial area in Egypt, where between 25 and 92 per cent of workers interviewed had misused tramadol.[159] In a study conducted in Nigeria, 19 per cent of bus drivers interviewed reported common misuse of tramadol.[160]

The problematic non-medical use of tramadol is visible in the high share of people entering drug treatment for tramadol use disorders. Egypt, Iraq, Nigeria and the United Arab Emirates specifically mentioned tramadol as one of the most frequently occurring primary drugs used by people in drug treatment.[161] Significant numbers have also been reported in other countries, including the Niger, Liberia and Sierra Leone, some of which have reported recent sharp increases in the demand for treatment for tramadol use disorders.[162]

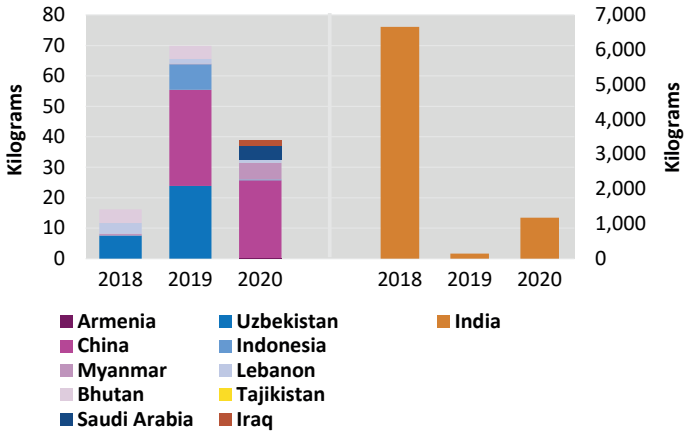
Are opioid crises spreading beyond regional hotspots?

Tramadol beyond Africa and the Middle East

The non-medical use of tramadol is reported by several countries outside the hotspots of West, Central and North Africa and the Middle East, although, in terms of seizures, seizures of tramadol in Asia and Europe are relatively small. In 2020, 9 countries in Asia reported seizures amounting to a total of 1.2 tons of tramadol, with India accounting for all but 39 kg.[163] In 2019, India reported seizures amounting to 144 kg, with six other countries reporting combined seizures amounting to 70 kg. In Europe, a total of approximately 96 kg of tramadol was seized by 17 countries in 2020, with the majority seized in Sweden (49 kg) and the Russian Federation (33 kg).

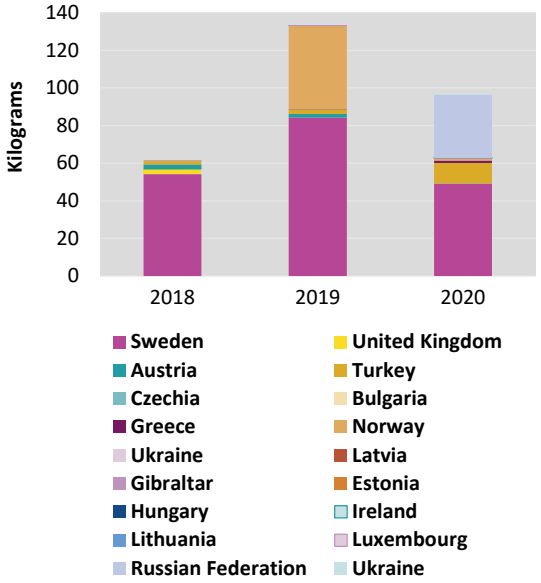
Wastewater analysis in China estimated the average consumption of tramadol in 2016 at 39.7 mg per day per 1,000 population and 34.8 mg per day per 1,000 population in 2017.[164] The study's authors found significant decreases in tramadol use in megacities between 2016 and 2019. The most likely source of tramadol in China was considered to be tramadol obtained by means of medical prescription, although it could not be concluded if the use of the substance was non-medical in nature.[165]

FIG. 86 Seizures of tramadol in Asia, 2018–2020



Source: UNODC, responses to the annual report questionnaire.

FIG. 87 Seizures of tramadol in Europe, 2018–2020



Source: UNODC, responses to the annual report questionnaire.

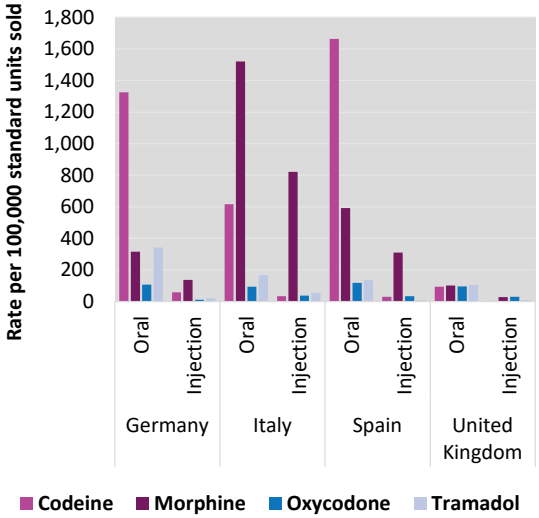
Other countries in South Asia and South-East Asia that reported some indications of the non-medical use of tramadol were Malaysia[166, 167] Bhutan, India, Myanmar,[168] Nepal, Sri Lanka,[169] the Republic of Korea[170, q] and Thailand.[171] Seizures also point to misuse in Armenia, Tajikistan and Uzbekistan.[172]

In the United States, tramadol ranks fourth among all pharmaceutical opioids in terms of non-medical use,[173] with approximately 1.5 million people or 0.5 per cent of the population aged 12 years and older reporting the non-medical use of the substance in 2020.

The non-medical use of tramadol, relative to other pharmaceutical opioids, remains low in Europe.[174] The Global Drug Survey, an online survey of mostly young people across 22 countries, mainly in Europe, reported a past-year prevalence of tramadol use of 6.4 per cent.[175] A four-country study conducted in Germany,

q In three wastewater treatment plants in the Republic of Korea, in 2018 the mean estimated consumption of tramadol was 27.5 mg per day per 1000 population and 1.7 times higher than the consumption rates found in 2013.

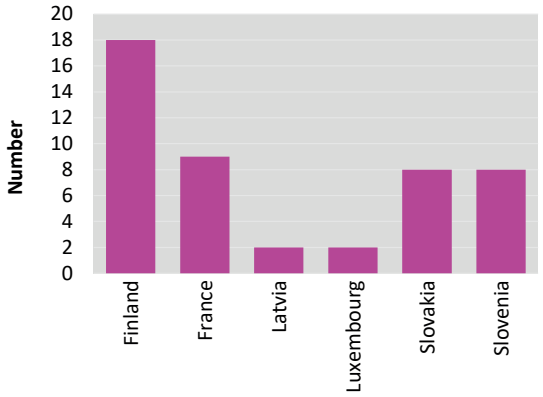
FIG. 88 Non-medical use of pharmaceutical opioids in Germany, Italy, Spain, and the United Kingdom, 2018



Source: Based on the table in Iwanicki et al., "Tramadol Non-Medical Use in Four European Countries".

Note: The rate of misuse of opioids was calculated on the basis of 100,000 standard units of opioids sold.

FIG. 89 Overdose deaths attributed to tramadol, selected countries in Western and Central Europe, 2019/20



Source: UNODC, responses to annual report questionnaire.

Italy, Spain and the United Kingdom using data from a multi-indicator analysis in the period 2015–2018 assessed the extent of the misuse among the general population of tramadol compared with other common pharmaceutical opioids and reported that codeine had the highest rate of misuse by adults and oxycodone the lowest. With the exception of Spain, the non-medical use of tramadol ranked second among pharmaceutical opiates in each country.[176]

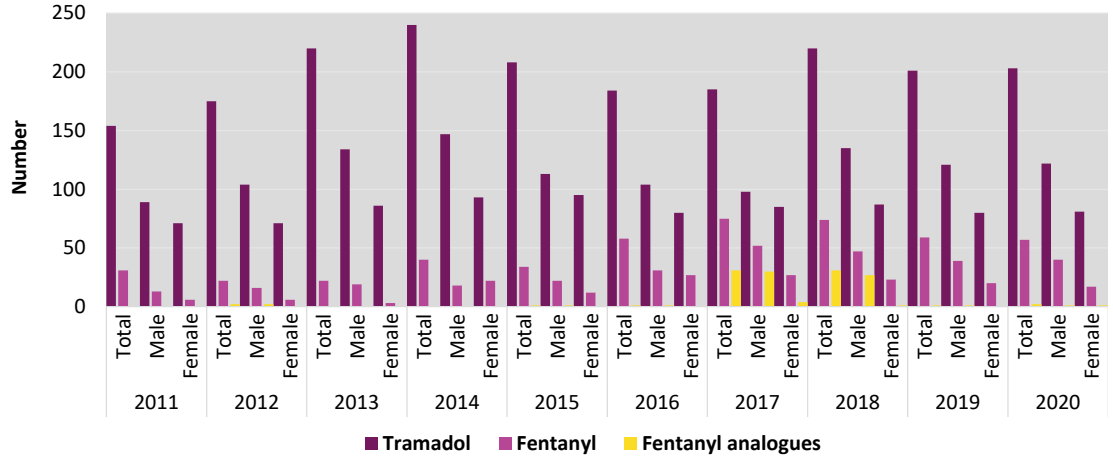
In Europe, each year, hundreds of overdose deaths attributed to tramadol are reported, but such reports are typically concentrated in a few countries.[177] In 2019/20, more than 300 overdose deaths attributed to tramadol were reported across the region. Most of the overdose deaths attributed to tramadol were reported in the United Kingdom.[178] In England and Wales, overdose deaths attributed to opioids have been increasing over the past three decades, and in 2020, 2,263 overdose deaths attributed to opioids were reported, 9 per cent of which were attributed to tramadol. About 70 per cent of overall opioid overdose deaths reported were among men. In 2020, however, the gender difference with regard to tramadol overdose deaths was less marked, as the percentage of such deaths among men dropped to 60 per cent.[179] Deaths in England and Wales related to fentanyl analogues were recorded only in 2017 and 2018.

In Norway, pooled data on overdose deaths for the period 2000–2019 indicated more than 3,000 deaths attributed to opioid overdose.[180] Between 2003 and 2019, the number of such deaths remained relatively stable, while over the same period, overdose deaths attributed to heroin declined. That was offset by an increase in overdose deaths attributed to pharmaceutical opioids, including fentanyls and tramadol, which have accounted for 3 per cent or more of the overdose deaths recorded since 2000. While overall opiate-related overdose deaths were more common among men, opioid overdose deaths, including those attributed to fentanyl and tramadol, were more common among women.

Fentanyls beyond North America

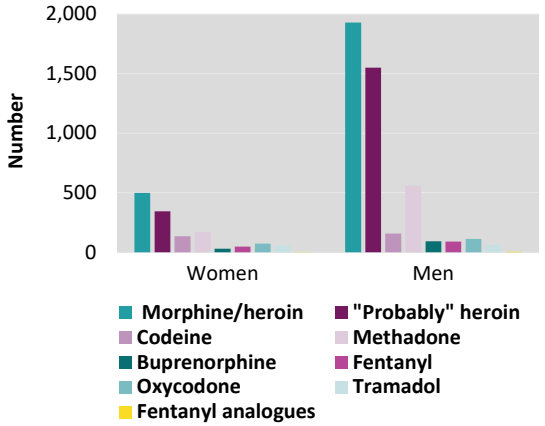
The use of fentanyls has been reported by several countries, although, currently, there are no indications of an epidemic of non-medical use and its related health

FIG. 90 Overdose deaths attributed to tramadol and fentanyls, by sex, England and Wales, 2011–2020



Source: United Kingdom, Office for National Statistics, "Deaths related to drug poisoning by selected substances in England and Wales".

FIG. 91 Overdose deaths attributed to opioids, by sex and type of opioid involved, Norway, 2000–2019



Source: Based on the data presented in Edvardsen and Clausen, "Opioid Related Deaths in Norway in 2000–2019".

consequences outside of North America, where experience has shown that fentanyls (and other research or novel opioids) can spread rapidly. Some of the supply factors accelerating the spread of fentanyls in North America include: diffusion of simpler, more effective methods of manufacture of synthetic opioids and their analogues (primarily fentanyls), facilitated by the availability on the Internet of instructions for their manufacture; an associated shift from preparation by a limited number of skilled chemists to preparation by "simple cooks"; an expanding number of fentanyl analogues and research opioids discovered; a lack of effective control over precursors and of oversight of the industry; expanding distribution networks that reduce the risk of detection through the use of postal services and the Internet; and increased licit trade, including e-commerce.[181, 182]

Considering these factors, fentanyls remain a potential threat in opioid markets. The spread of fentanyls could occur rapidly if market dynamics result in a shortage of the main opioid used in any of the markets.

Europe[183] has a particularly diverse opioid problem, with various primary opioids reported through different indicators. These include heroin, methadone (illicit or street methadone), buprenorphine and fentanyls. Since 2012, 34 new fentanyls have been identified on the drug market in Europe,[184] and seizures of fentanyls in Europe are becoming more widespread. The quantity of fentanyls seized in Europe amounted to a total of 15 kilograms in 2019, reported by 11 countries, three times the quantity seized in 2018. In 2020, however, 20 countries in Europe reported seizures of fentanyls

amounting to about 6.8 kg.[185] These figures suggest an increased priority and capacity of countries to detect fentanyls and/or an increased supply of the substances in the European illicit markets.

Fentanyl and its analogues are sold on the European market via online sources and at street level, sometimes misrepresented as or adulterated with heroin or other drugs, such as falsified benzodiazepines.[186] The main fentanyl analogues identified in Europe and implicated in a relatively large number of overdose deaths were cyclopropylfentanyl, carfentanil and acryloylfentanyl (78, 61 and 47 deaths, respectively, in 2018).[187] European markets also see, with concern, a diverse array of means of administration of fentanyls, including nasal sprays and e-liquids for vaping in electronic cigarettes.[188]

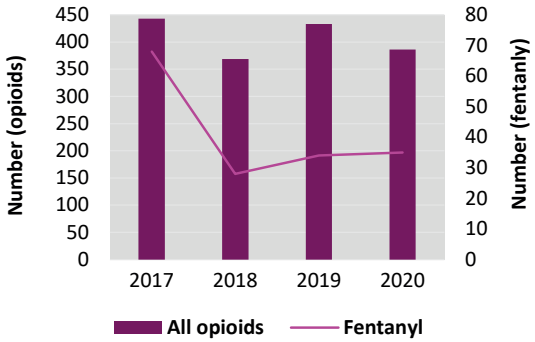
Fentanyls do not appear to be established in the opioid market in Europe, except for some pockets of use. For example, the syringes monitoring programme,[r] which collects information on substances injected in selected sites in Western Europe, showed that, in Vilnius, one third of collected and analysed syringes contained residues of carfentanil.[189] In Paris, Oslo and Cologne, Germany, 1 per cent or less of the collected syringes contained fentanyl residues.

Between 2017 and 2018, Sweden, Estonia and Germany reported marked decreases in the number of deaths related to fentanyl and its analogues, whereas Finland reported an increase from 4 to 11 cases.[190] In Germany, the number of fentanyl overdose deaths has remained stable, at approximately 35 deaths each year since 2018. Sweden, which in the past reported high rates of overdose deaths attributed to the use of opioids, including heroin and fentanyls, has seen rates fall considerably since 2016, and in 2020, the country recorded no deaths related to fentanyl analogues.

Following a decline in heroin availability in Estonia, 3-methylfentanyl appeared on the drug market in 2002. By 2005, 3-methylfentanyl and mixtures of 3-methylfentanyl and fentanyl accounted for the majority of opioids seized and for an increasing number of overdose deaths.[191] In 2018, fentanyl and carfentanil were the two main synthetic opioids used by regular opioid users.[192] However, since then, overdose deaths have declined considerably, and in 2020, 31 drug overdose deaths were recorded, down from a peak of 170

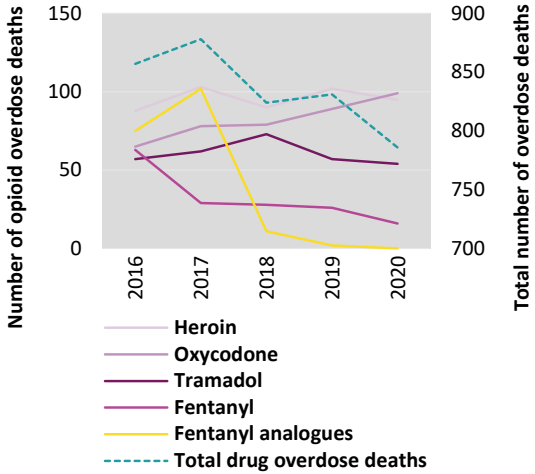
r The programme collects information on substances injected by analysing the residual content of discarded syringes collected from different programmes in selected sites across Western Europe. It does not include Eastern Europe.

FIG. 92 Overdose deaths attributed to opioids and fentanyls, Germany, 2017–2020



Source: Germany, Federal Criminal Police Office (Bundeskriminalamt), "Rauschgiftkriminalität: Bundeslagebild 2020", and previous years (in German).

FIG. 93 Opioid overdose deaths in Sweden, 2016–2020



Source: Sweden, National Board of Forensic Medicine, 2020.

Note: The data represent the number of poisoning deaths in relation to which the specified substance or substances were detected in blood and assessed as contributing to the death, either alone or in combination with other substances.

FIG. 94 **Drug overdose deaths in Estonia, 2000–2020**

Source: Estonian Forensic Science Institute, for the data for the period 2000–2009; and Estonian Causes of Death Registry, for the data for the period 2010–2020.

Note: Nearly all of the drug overdose deaths were attributed to fentanyls.

such deaths in 2012, owing in part to the reduced availability of fentanyl and the wider roll-out of the take-home naloxone programme.[193]

Fewer data are available from Asia, where India and China reported seizures of fentanyls amounting to 26.3 kg in 2018.[194] In 2020, Armenia, China, Israel, and the Republic of Korea reported small amounts of fentanyls seized (a total of 155 grams).

In wastewater samples collected from 30 cities across seven regions of China between 2016 and 2019, fentanyl was detected in only a small number of samples, with only 5 per cent or less of samples in different rounds detecting low levels of fentanyl metabolites.[195]

In Australia, the non-medical use of fentanyls is not uncommon. In 2018, there were 189 overdose deaths[s] involving fentanyl, pethidine or tramadol,[t] comprising 21 per cent of all overdose deaths involving opioids and representing a more than thirteenfold increase, from 14 deaths in 2001 to 189 in 2018.[196] According to wastewater analyses conducted across Australia, average per capita consumption of fentanyl at state capital sites was approximately half of that observed at sites outside the capitals between August 2018 and June 2021 (approximately 4 doses per 1,000 people per day and around 8 doses per 1,000 people per day, respectively). Prior to December 2018, there had been a steady (though not uniform) increase in consumption of fentanyl in the capital cities and outside them. However, since then, the consumption of fentanyl at all sites has declined considerably, falling to around 2 doses per 1,000 people per day at all sites.[197] However, it should be noted that wastewater analysis cannot differentiate between the use of opioids, including fentanyl, for therapeutic purposes and their non-medical use.

s These are labelled as unintentional drug induced deaths.
t Overdose deaths for these substances are reported together.

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GLOSSARY

amphetamine-type stimulants — a group of substances composed of synthetic stimulants controlled under the Convention on Psychotropic Substances of 1971 and from the group of substances called amphetamines, which includes amphetamine, methamphetamine, methcathinone and the "ecstasy"-group substances (3,4-methylenedioxymethamphetamine (MDMA) and its analogues).

amphetamines — a group of amphetamine-type stimulants that includes amphetamine and methamphetamine.

annual prevalence — the total number of people of a given age range who have used a given drug at least once in the past year, divided by the number of people of the given age range, and expressed as a percentage.

coca paste (or coca base) — an extract of the leaves of the coca bush. Purification of coca paste yields cocaine (base and hydrochloride).

"crack" cocaine — cocaine base obtained from cocaine hydrochloride through conversion processes to make it suitable for smoking.

cocaine salt — cocaine hydrochloride.

drug use — use of controlled psychoactive substances for non-medical and non-scientific purposes, unless otherwise specified.

fentanyls — fentanyl and its analogues.

new psychoactive substances — substances of abuse, either in a pure form or a preparation, that are not controlled under the Single Convention on Narcotic Drugs of 1961 or the 1971 Convention, but that may pose a public health threat. In this context, the term "new" does not necessarily refer to new inventions but to substances that have recently become available.

opiates — a subset of opioids comprising the various products derived from the opium poppy plant, including opium, morphine and heroin.

opioids — a generic term that refers both to opiates and their synthetic analogues (mainly prescription or pharmaceutical opioids) and compounds synthesized in the body.

problem drug users — people who engage in the high-risk consumption of drugs. For example, people who inject drugs, people who use drugs on a daily basis and/or people diagnosed with drug use disorders (harmful use or drug dependence), based on clinical criteria as contained in the Diagnostic and Statistical Manual of Mental Disorders (fifth edition) of the American Psychiatric Association, or the International Classification of Diseases and Related Health Problems (tenth revision) of WHO.

people who suffer from drug use disorders/people with drug use disorders — a subset of people who use drugs. Harmful use of substances and dependence are features of drug use disorders. People with drug use disorders need treatment, health and social care and rehabilitation.

harmful use of substances — defined in the International Statistical Classification of Diseases and Related Health Problems (tenth revision) as a pattern of use that causes damage to physical or mental health.

dependence — defined in the International Statistical Classification of Diseases and Related Health Problems (tenth revision) as a cluster of physiological, behavioural and cognitive phenomena that develop after repeated substance use and that typically include a strong desire to take the drug, difficulties in controlling its use, persisting in its use despite harmful consequences, a higher priority given to drug use than to other activities and obligations, increased tolerance, and sometimes a physical withdrawal state.

substance or drug use disorders — referred to in the Diagnostic and Statistical Manual of Mental Disorders (fifth edition) as patterns of symptoms resulting from the repeated use of a substance despite experiencing problems or impairment in daily life as a result of using substances. Depending on the number of symptoms identified, substance use disorder may be mild, moderate or severe.

prevention of drug use and treatment of drug use disorders — the aim of "prevention of drug use" is to prevent or delay the initiation of drug use, as well as the transition to drug use disorders. Once a person develops a drug use disorder, treatment, care and rehabilitation are needed.

REGIONAL GROUPINGS

The *World Drug Report* uses a number of regional and subregional designations. These are not official designations, and are defined as follows:

AFRICA

- East Africa: Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Mauritius, Rwanda, Seychelles, Somalia, South Sudan, Uganda, United Republic of Tanzania and Mayotte
- North Africa: Algeria, Egypt, Libya, Morocco, Sudan and Tunisia
- Southern Africa: Angola, Botswana, Eswatini, Lesotho, Malawi, Mozambique, Namibia, South Africa, Zambia, Zimbabwe and Reunion
- West and Central Africa: Benin, Burkina Faso, Cabo Verde, Cameroon, Central African Republic, Chad, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, Togo and Saint Helena

AMERICAS

- Caribbean: Antigua and Barbuda, Bahamas, Barbados, Cuba, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Anguilla, Aruba, Bonaire, Netherlands, British Virgin Islands, Cayman Islands, Curaçao, Guadeloupe, Martinique, Montserrat, Puerto Rico, Saba, Netherlands, Sint Eustatius, Netherlands, Sint Maarten, Turks and Caicos Islands and United States Virgin Islands
- Central America: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama
- North America: Canada, Mexico, United States of America, Bermuda, Greenland and Saint-Pierre and Miquelon
- South America: Argentina, Bolivia (Plurinational State of), Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela (Bolivarian Republic of) and Falkland Islands (Malvinas)

ASIA

- Central Asia and Transcaucasia: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan
- East and South-East Asia: Brunei Darussalam, Cambodia, China, Democratic People's Republic of Korea, Indonesia, Japan, Lao People's Democratic Republic, Malaysia, Mongolia, Myanmar, Philippines, Republic of Korea, Singapore, Thailand, Timor-Leste, Viet Nam, Hong Kong, China, Macao, China, and Taiwan Province of China
- South-West Asia: Afghanistan, Iran (Islamic Republic of) and Pakistan
- Near and Middle East: Bahrain, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, United Arab Emirates, Yemen and State of Palestine
- South Asia: Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka

EUROPE

- Eastern Europe: Belarus, Republic of Moldova, Russian Federation and Ukraine

- South-Eastern Europe: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Montenegro, North Macedonia, Romania, Serbia, Türkiye[a] and Kosovo[b]
- Western and Central Europe: Andorra, Austria, Belgium, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, Norway, Poland, Portugal, San Marino, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom of Great Britain and Northern Ireland, Faroe Islands. Gibraltar and Holy See

OCEANIA

- Australia and New Zealand: Australia and New Zealand
- Polynesia: Cook Islands, Niue, Samoa, Tonga, Tuvalu, French Polynesia, Tokelau and Wallis and Futuna Islands
- Melanesia: Fiji, Papua New Guinea, Solomon Islands, Vanuatu and New Caledonia
- Micronesia: Kiribati, Marshall Islands, Micronesia (Federated States of), Nauru, Palau, Guam and Northern Mariana Islands

a Further to the communication dated 31 May 2022 from the permanent mission addressed to the Executive Office of the Secretary-General, the country name was changed from the former name of the Republic of Turkey (former short form: Turkey), with immediate effect. The *World Drug Report 2022* was prepared before that date and thus uses the former name in its reporting and analysis, except for the maps that were finalized more recently.

b References to Kosovo shall be understood to be in the context of Security Council resolution 1244 (1999).

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UNODC Research

Consisting of five separate booklets, the *World Drug Report 2022* provides an in-depth analysis of global drug markets and examines the nexus between drugs and the environment within the bigger picture of the Sustainable Development Goals, climate change and environmental sustainability.

Booklet 1 summarizes the four subsequent booklets by reviewing their key findings and highlighting policy implications based on their conclusions. Booklet 2 provides an overview of the global demand for and supply of drugs, including an analysis of the relationship between illicit drug economies and situations of conflict and weak rule of law. Booklet 3 reviews the latest trends in the global markets for opioids and cannabis at the global and regional levels, and includes a discussion of the potential impact of changes in opium poppy cultivation and opium production in Afghanistan, and an analysis of early indications of the impact of cannabis legalization on public health, public safety, market dynamics and criminal justice responses in selected jurisdictions. Booklet 4 presents the latest trends in and estimates of the markets for various stimulants – cocaine, amphetamines and "ecstasy" – and new psychoactive substances, both at the global level and in the most affected subregions, including an analysis of different coca bush eradication strategies and a focus on the expansion of the methamphetamine market in South-West Asia. Booklet 5 delves into the nexus between drugs and the environment, providing a comprehensive overview of the current state of research into the direct and indirect effects of illicit drug crop cultivation and drug manufacture, as well as drug policy responses on the environment.

The *World Drug Report 2022* is aimed not only at fostering greater international cooperation to counter the impact of the world drug problem on health, governance and security, but also, with its special insights, at assisting Member States in anticipating and addressing threats from drug markets and mitigating their consequences.

The accompanying statistical annex is published on the UNODC website:
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